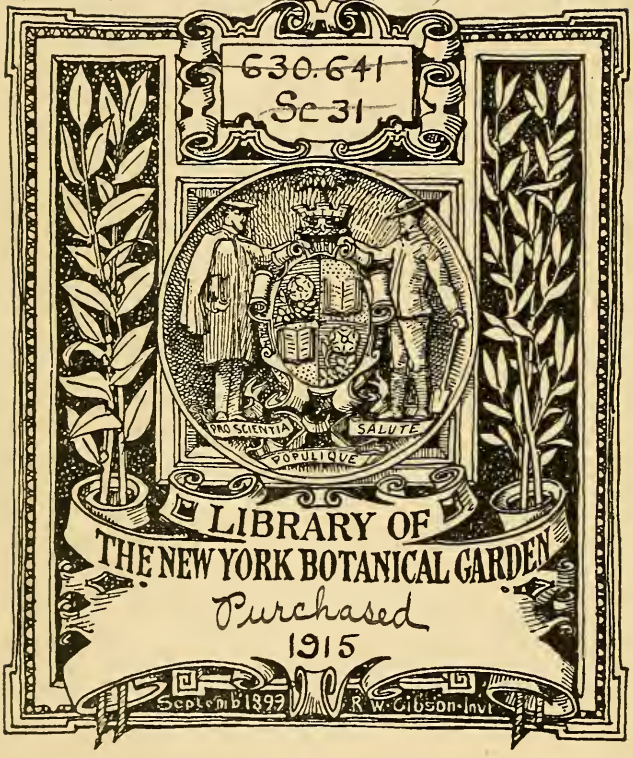

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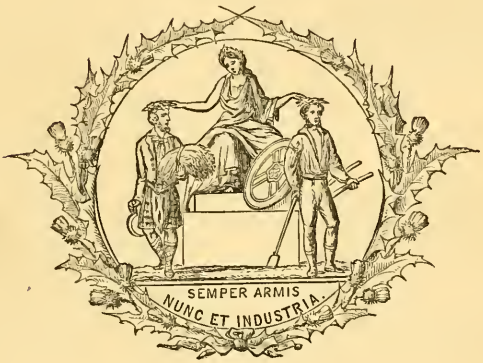

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CONTENTS.

PAGE

1. Dietaries of Scotch Agricultural Labourers. By Robert Hutchison, ... 1
2. Foot Rot in Sheep. By Hugh Borthwick, . . . 30
3. Shirreff's Bearded White Wheat. By Patrick Shirreff, . 38
4. Pruning of Forest Trees. By John Morrison, . . 42
5. Different Descriptions of Food for Stock. By R. J. Thomson.
   1. Comparative Feeding Values of Swedes and Mangold Wurzel, 1864, 52
   2. Comparative Feeding Values of Swedes and Mangold Wurzel, 1865, 60
   3. Comparative Feeding Values of Bean and Oatmeal, 1864, . 66
6. Different Top-Dressings. By Russell Swanwick.
   1. On Rye Grass and Clover, Crop 1865, ... 72
   2. On Turnips, Crop 1865, ... 83
   3. On Wheat, Crop 1865, ... 86
7. Field Experiments on the Action of an equal Money Value of Different Top-Dressings on Wheat, Grass, and Cabbage, 1866. By Russell Swanwick, ... 90
8. Turnips for Seed. By John Morrison, . . . 101
9. Hedge-Row Trees. By John Morrison, . . . 105
10. Comparative Productiveness of Turnips. By Hary Shaw, . 110
11. Experiments on Oats with two different Manures. By William Walker, ... 116
12. Management and Value of Poplar. By C. Y. Michie, . 118
13. Phosphatic and Ammoniacal Manures. By R. J. Thomson, . 137
14. Cultivation of Mangold Wurzel. By R. J. Thomson, . 146
15. The Agriculture of Perthshire. By John Dickson, . 160
16. Proceedings of the Chemical Department. By Thomas Anderson, M.D., F.R.S.E., Chemist to the Society.
   1. Analyses of the Soils and Subsoils on which the Field Experiments of 1866 were made, ... 190
   2. Experiments made during the Season 1867, . . . 211
17. General Management of Plantations. By C. Y. Michie, . 245
18. Agriculture of Dumfriesshire. By the Rev. John Gillespie, A.M., 270
19. Agriculture of Dumfriesshire. By H. Newby Fraser, . 326
20. Pruning of the Rarer Coniferæ. By Robert Hutchison, . 335
21. Comparative Productiveness of Turnips. By John Milne, . 340
22. Scab in Sheep. By Hugh Borthwick, ... 346
23. The Isle of Man—Its Agriculture, Climate, &c. By John Honeyman, ... 359
24. Larch Forests. By C. Y. Michie, ... 368

MAR 17 1915

PAGE

25. Larch Forests. By John Grigor, ... 415

26. Reclamation of Waste Land on the Farms of Lochend and Syster, in the County of Caithness, By James Purves, . 429

27. Improvement of Meadow Pasturage on Part of the Crown Lands of Dorrery, in the County of Caithness. With Plan. By James Purves, ... 439

28. Trees not Liable to be Destroyed by Rabbits. By C. Y. Michie, 446

29. Trees not Liable to be Destroyed by Rabbits. By Robert Hutchison, ... 456

30. Transit of Stock. By George Menzies, . . . 461

31. Proceedings of the Chemical Department. By Thomas Anderson, M.D., F.R.S.E., Chemist to the Society,

1. On the Composition of the Different Kinds of Linseed, and the Cakes they yield, ... 489
2. Analyses ofthe Soils and Subsoils on which the Field Experiments of 1867 were made, ... 502
3. Note regarding Field Experiments, 1868, . . . 512

APPENDIX (A).

Proceedings of the Highland and Agricultural Society—

Preliminary Notice, ... 1
Proceedings at General Meetings, June 1866 to January 1868, . 2
Proceedings at Board Meetings, 1867–68, . . . 33
Premiums awarded by the Society in 1867, . . . 46
Returns of Seed Competitions held in 1867, . . . 67
List of Ploughing Competitions held in 1866-67, . . 68
State of the Funds of the Society at 30th Nov. 1867, . . 73
Abstract of the Accounts of the Society for 1866-67, . . 74
Abstract of the Accounts of the Glasgow Show, 1867, . . 76
Abstract of the Accounts of the Argyll Naval Fund, 1866–67, . 76
Standing Committees for 1868, ... 78

APPENDIX (B).

Proceedings at General Meetings, June 1868 and January 1869, 81
Proceedings at Board Meetings, 1868–69, . . . 96
Premiums awarded by the Society in 1868–69, . . . 107
Returns of Seed Competitions held in 1868, . . . 124
List of Ploughing Competitions held in 1867–68, . . 125
State of the Funds of the Society at 30th Nov. 1868, . . 129
Abstract of the Accounts of the Society for 1867-68, . . 130
Abstract of the Accounts of the Aberdeen Show, 1868, . . 132
Abstract of the Accounts of the Argyll Naval Fund, 1867–68, 134

APPENDIX (C).

Premiums Offered by the Society in 1868, . . . 1

APPENDIX (D).

Premiums Offered by the Society in 1869, . . . 1

APPENDIX (E).

List of Members of the Society, 1869, ... 1

Index.

APPENDIX (C).

PREMIUMS

OFFERED BY

THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND.

IN

1868.

CONTENTS.

PAGE

General Notice, ... 5
Constitution and Management, ... 7
Establishment for 1868, ... 8
Council on Education, ... 10
General Regulations for Competitors, ... 11

CLASS I.—REPORTS.

§ 1. On Subjects connected with the Science and Practice of Agriculture :—

1. Agriculture of Aberdeenshire and Banffshire, . . . 12
2. Agriculture of East Lothian, ... 12
3. Manures produced by different kinds of Feeding, . . . 12
4. Manures made with and without cover, ... 13
5. Autumn manuring, ... 13
6. Improved varieties of Agricultural Plants, ... 13
7. Comparative productiveness, &c., of Potatoes, . . . 14
8. Comparative productiveness, &c., of Turnips, . . . 14
9. Cultivation of Cabbage as a field Crop, ... 14
10. Vegetable productions of India, China, America, &c., . . 14
11. Best modes of housing fattening Cattle, ... 15
12. Different descriptions of Food for Stock, ... 15
13. Examining Horses as to Soundness, ... 15
14. Pleuro-pneumonia, ... 15
15. Disinfecting Agents for Stock, ... 16
16. Sanitary arrangements for Stock, ... 16
17. Transit of Stock, ... 16
18. Dipping and smearing Sheep, ... 16
19. Management of Poultry, ... 16
20. Rural economy Abroad, ... 17

§ 2. Land Improvements :—

1. General improvement of Estates, ... 17
2. Reclamation of Waste Land by Tillage, ... 17
3. Improvement of Natural Pasture without Tillage, . . 18

§ 3. Agricultural Machinery :—

Invention or improvement of Implements of Husbandry, . 18

§ 4. Woods and Plantations :—

1. Extensive planting, ... 18
2. Formation and management of Young Plantations, . . 18
3. General management of Plantations, ... 19
4. Planting on exposed or on barren Tracts, ... 19

PAGE

5. Corsican Fir, ... 20
6. American and Canadian Trees, ... 20
7. Forest Trees of recent introduction, ... 20
8. Roots of Coniferæ, ... 20

CLASS II.—DISTRICT COMPETITIONS.

§ 1. Cattle, ... 21
§ 2. Draught Horses, ... 23
Entire Colts, ... 24

§ 3. Sheep :—

1. Leicester, ... 25
2. Cheviot, ... 25
3. Blackfaced, ... 26
4. Shearing Sheep, ... 27

§ 4. Swine :— 28

CLASS III.—DAIRY PRODUCE.

1. Butter, ... 29
2. Cheese, ... 29

CLASS IV.—CROPS AND CULTURE.

1. Seeds, ... 31
2. Ploughing Competitions, ... 33
3. Reaping Machines, ... 33
4. Medals in Aid of Premiums given by Local Societies, . . 34

CLASS V.—COTTAGES AND GARDENS.

1. Best kept Cottages and Gardens, ... 38
2. Improving existing Cottages, ... 40
3. Building New Cottages, ... 40
4. Accommodation for Farm Servants, ... 40

GENERAL SHOW AT ABERDEEN IN 1868, ... 41

GENERAL SHOW AT EDINBURGH IN 1869, ... 57

Veterinary College, ... 60

Agricultural Education, ... 61

Chemical Department, ... 63

Instructions for Selecting Samples for Analyses, . . 64

Charges for Analyses, &c., ... 65

TRANSACTIONS

OF

THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND.

REPORT ON THE DIETARIES OF SCOTCH AGRICULTURAL LABOURERS.

By Robert Hutchison of Carlowrie, Kirkliston.

[*Premium—Twenty Sovereigns.*]

A careful investigation of popular dietetics forms a subject of interesting research, from the accurate study of which much practical good may be anticipated if it leads to the adoption of any improvement; and the present is certainly the time to make such an inquiry, when the course of events arising out of the recent prevalence of rinderpest, and consequent enhanced value of butcher meat and other articles of daily food, threatens to retard and impede, if not entirely to throw back for a time, the spontaneous improvement of the dietaries of the rural population of the country.

The school of Liebig have, doubtless, done much good, but their statistical basis seems too narrow, and they have, perhaps, at so early a period of the inquiry, formulated the *ingesta* of various dietaries too precisely and minutely, and hence the results of their theories have not obtained such practical and popular support and trial as the elaborate nature of their investigations deserves, and which the general confidence theoretically placed in their system appears to warrant. The difficulty, moreover, of undertaking experiments, or of obtaining returns upon a satisfactory scale, and with an equality of fairness in all points, leaves the matter still vague, and as regards the agricultural dietary in Scotland at least, susceptible of much further useful investigation. For if the daily consumpt of nutritive food by the Scotch peasant and his family can be proved to be in-

adequate in many cases to the maintenance of the body in physical and muscular health and strength, any improvement upon such a state of the social condition of this class of the population would be most invaluable, seeing there can be no doubt that an insufficient supply of the nourishment required by the animal wants of the body is productive of an impaired condition of health, derangement of the functions of the system and consequent disease, and in extreme cases, where the absence of proper nutriment reaches the point of privation, of starvation and death. Without, however, going so far as to expect to find in the low-fed population of the country extreme cases of starvation, even in isolated instances, to be common, there can be no doubt that we may naturally expect to hear of some families amongst the poorer classes in remote rural districts, who do not feed themselves adequately. This idea receives an appearance of truth, when we find in some places in the agricultural mainland of Scotland, that the death-rate of the population is far above what it might be expected to be, considering the salubrity of the situation; while in those localities also, many of the peasantry who do survive to advanced years are generally martyrs to chronic catarrh and rheumatism; and although, doubtless, the ailments referred to arise in great measure from the peasant's regardlessness of exposure to cold and damp, still an insufficient diet may have much to do with the matter, and it is therefore quite fair to infer that, with more attention to a proper and adequate dietary, or by an assimilation of the dietary of these districts to those of other quarters similarly situated, where the mortality exhibits a decreased ratio, the death-rate of the low-fed population would be lessened. Take, for example, and by way of comparison between two districts where a dissimilar dietary prevails, the following statistical figures, calculated from the "*Eighth Detailed Annual Report of the Registrar-General of Births, Deaths, and Marriages in Scotland*, 1866." In the agricultural districts of Moffat (Dumfriesshire), the salubrity of which cannot be denied, the percentage of deaths is 1·747; in Glencairn parish (Dumfriesshire), it is 2·142; in Kirkmabreck district (Kirkcudbrightshire), it is as high as 2·755; and in the rural portion of Newton-Stewart parish (Wigtonshire), it is 1·945. In all these localities the fare of the agricultural classes is very poor and scanty, and the use of peasemeal is almost unknown. On the other hand, in the Border counties to the eastward, where the diet is more liberal, and the use of peasemeal, rendered palatable by admixture with barley-meal, is very common, if not general, and forms a considerable portion of the daily food of the same classes, we find the death-rate is a good deal lower. In the parish of Traquair (Peeblesshire), for example, it is only 1·018 per cent.; in Drumelzier (Peeblesshire), it is 1·435

per cent.; in Yarrow (Selkirkshire), 1·400; and in Linton (Jedburgh), it is only 0·493 per cent. It must, therefore, be evident that the primary classification of foods into "heat-producing" or respiratory food (carbonaceous), and "flesh-forming" food (nitrogenous) is, if attended to in practical use, highly important; and it is an inquiry worthy of more consideration than has hitherto been given it, whether the labouring classes might not with advantage partake more liberally than they do in their daily dietary of a mixture of pease and beans with other farinaceous food, so as to render the mixed dish or bread really palatable. In India, where animal diet is not allowed at all, the Brahmins understand the advantages of the use of such a diet as we recommend; and the laity who dare to eat of "*Brahmin's food*" (a mess of rice and lentils), are punished. The most palatable and wholesome way in which we advise the use of pease or beans, is in the form of soup, made with a very little suet, or dripping, or pork-bone. Cooked in this manner, pease or beans (dry) afford an agreeable dinner, and a diet possessed of highly nutritive value.

Local distinctions or peculiarities of diet may exercise an important influence in determining the particular localisation of any epidemic or disease amongst a given class; and to form a proper and accurate estimate of the sanitary condition of any section of the community, it is necessary to give due consideration to the usual diets (as to nature, quantity, and quality), of the district. Hence an investigation, like the present, amongst the agricultural population, whose sanitary arrangements are universally known to be very deficient, and greatly behind those of England, acquires a special value of its own; and with the view of making the inquiry as exhaustive as possible, we have appended a number of instances selected from different districts of Scotland, both insular and mainland rural, and from as wide a geographical area as possible—choosing in each instance true typical and characteristic specimens of the classes represented.

The number of selected instances given amounts to fifty-six, and they include the dietary of ploughmen, shepherds, cattlemen, field-workers (male and female), and occasional day-labourers, with an example of miners employed in the lead-mines of Dumfriesshire, and of railway porters employed at road-side stations in agricultural districts.

The difficulty encountered in the collection of these returns was in many instances considerable, and the utmost tact was frequently requisite to obtain the desired information in detail; for the lower classes, especially in country districts, are generally averse to divulge the secrets of their domestic arrangements and mode of living—regarding the process of weighing and measur-

ing their food with superstitious awe and fear, and hesitating sometimes to give direct replies to such occasional queries as were essentially necessary to be put to obtain accurate information regarding their dietaries and modes of life. Under these circumstances, and seeing that such a position of matters prevented the inquiry being as exhaustive as we wished, it is hoped that any omissions made in the compilation of these statistics may be pardoned, and with regard to the cases enumerated, we can assert that they may be accepted as true and typical of the great mass of the Scotch agricultural population.

Without recapitulating in detail the particulars obtained, we would merely refer those interested in seeing the different articles of food consumed at the rural labourer's table, as also the number of daily meals taken by him and his family, with other details of his family's income, to Appendix "A" of this Report; and by way of analysis of the different values (dietetically) of the various substances in daily and weekly use, we have to refer to Appendix "B," where we have, in a few selected instances from different localities, endeavoured to show the amount of the probable weekly consumpt of different articles of food by the labourer and his family, and have tabulated against the quantity used by each example, the relative amount of *nutritive* food consumed, as expressed by the equivalent number of grains of carbon and nitrogen in the respective quantities. The data upon which the calculations of these elements are based have been taken from the chemical analysis of the substances themselves, as specified by Dr Edward Smith* and Professor Lyon Playfair,† in recent publications.

In submitting, without further comment, the collected information obtained in the Appendices to this Report, we may draw attention merely to such points in the returns as appear of more special interest, and as such calling for particular remark.

The first noticeable feature in the Scotch rural dietary, which must strike even the most casual observer, is its uniformity in most of the districts throughout the country. Whether inland or sea-coast, highland or lowland, the great staples for sustaining life amongst the peasantry of Scotland are oatmeal and milk. In this particular, the difference between the English and Scotch labourers is very decided; for while the use of oatmeal in the sister country is almost unknown, it forms the leading article of daily sustenance amongst 90 per cent. of the families of the labouring classes in Scotland. Indeed, so much is this the case, that amongst the fifty-six families cited in our returns (besides many others, the full particulars of which have not been yet

* Practical Dietary, by Dr E. Smith. London. 1864.

† On the Food of Man in Relation to his Useful Work. Lyon Playfair. Edinburgh, 1865.

tabulated), we find that oatmeal is invariably used, and in no instance have we been able to point out an exception to this rule amongst the rural population.

The high dietetic value of oatmeal is a very important feature, where its use is so universal in any district or country as it is in Scotland; and when taken in connection with milk as the other staple article of food and nourishment, its competency to afford a great amount of physical nutriment is considerably enhanced, for we find that as a nutritive agent, milk is almost unequalled. Whether its use be limited to the undeveloped system of an infant, to the enfeebled and debilitated frame of an invalid, or to the brawny and muscular conformation of the hardy day labourer in any of our industrial employments, where his muscular system receives its greatest and most continued strain, we find the suitability of milk for maintaining the frame in vigour, or for nourishing or recruiting the daily waste of matter of the bodily functions, equally undeniable; while its value is still further increased from the fact of its being one of the most easily digested foods in use by the peasantry. Having regard to poverty of diet in any one district, we would impress most urgently in that quarter the necessity for using every effort to increase the supply of milk, for the state of health and immunity from scrofulous disease, amongst the poorly fed and clad population, are usually in proportion to the quantity of milk accessible, and there could be no more efficient aid given to the rural agricultural population generally, in the direction of an improved dietary, than by affording them the means of obtaining an increased supply of milk regularly. We may notice case No. 5, Appendix "A," as an instance of a very low-fed family's health being mainly supported by milk; while in the same parish of the island of Skye, case No. 7, Appendix "A," affords a very fair example of a weakly constitutioned family suffering from scrofulous disease, attributable in no small degree to the absence of milk from their dietary. In the neighbourhood of large towns we found the labourers complain much of the difficulty of obtaining milk, even in scanty supplies, and this scarceness of so important an article of diet leads to the substitution of treacle and water, or sugar and water, and in a very few rare instances of beer. None of these can in any way be compared (as regards nutritive properties) with milk, while the presence of such substitutes does not act upon systems having any scrofulous tendency or liability to cutaneous eruptions in the beneficial manner in which milk does, but rather the reverse.

Potatoes also form a large proportion of the general national dietary of Scotch agricultural labourers. As an article of nutritive value, potatoes cannot be said to rank high. The cheapness of this commodity is its chief recommendation, and it may be

said rather to be well adapted to the income of the labourer, than to his physical wants. He is thus enabled to consume at small cost a larger quantity or volume of this species of food than of many others, and in this way some part of its deficiency as a nutritive agent is recompensed.

The nutritive values of these three staple articles of Scotch agricultural dietaries may be stated as follows :—

Scotch oatmeal, per lb., contains . .	2800 grains carbon.
„ „	140 „ nitrogen.
	2940 grains nutritive food.
Potatoes, per lb., contain . .	770 grains carbon.
„ „	24 „ nitrogen.
	794 grains nutritive food.
Sweet milk, per imperial pint, contains	546 grains carbon.
„ „	43¾ „ nitrogen.
	589¾ grains nutritive food.

The next remarkable feature in the rural dietaries of Scotland, as compared with those of England, is the largely increased amount of nutritive food obtained at a less cost. This does not arise from any relative difference in the market value of any given article of food between the two countries, but solely from the custom and modes of living of the people. Thus, we find that, according to Dr E. Smith's Report to the Privy Council,* the total average amount of carbon and nitrogen obtained per adult weekly in England, is 40,673 grains carbon, and 1594 grains nitrogen, costing per adult weekly, 2s. 11⅞d. In Scotland, according to our Appendix, the average weekly consumption per adult, is 41,752 grains carbon, and 2094 grains nitrogen, at a cost of about 2s. 10d. Hence the economy of the relative expenditure will stand thus :—For each shilling expended by the English labourer upon his dietary, he obtains 12,398 grains carbon, and 495 grains nitrogen ; while, according to the dietary adopted by the Scotch labourer, the same sum will purchase 14,868 grains carbon, and 716 grains nitrogen. It may be necessary here to remark that, according to Dr E. Smith's calculations, the average weekly consumpt of carbon and nitrogen by the Scotch peasantry is considerably higher than the amount mentioned above, according to our figures and data. Dr Smith gives the amount of carbon weekly consumed per head in Scotland as 48,980 grains, and of nitrogen as 2348 grains. This discrepancy arises from the imperfect average of area from which he com-

* Sixth Report of the Medical Officer of the Privy Council, 1863. Appendix, p. 292.

putes his consumption of nutritive food, and from his omission of the insular districts, such as Skye, &c., for the returns we have obtained from these quarters materially lessen the general average of the whole country. In Skye, the dietary of the lower classes is more deficient, both in quantity and nutritive value, than in any other district of Scotland. At one time they are at the point of starvation, subsisting on what scant fare nature in that most rugged and barren tract affords, and at another, luxuriating on what windfalls come to them after a storm in the shape of an abundance of shell-fish. One family in this island we found had not seen butcher meat for five years, and there are many who never tasted beer or cheese!

For the purpose of comparing the average weekly consumpt of nutritive food by agricultural *labourers*, and by agricultural computed *adults* in Scotland, we have prepared the following table :—

SCOTCH AGRICULTURAL LABOURERS.		SCOTCH AGRICULTURAL COMPUTED ADULTS.
	Grains consumed per week.	Grains consumed per week.
Carbon, ...	51,809	41,752
Nitrogen, ...	2,657¼	2,094
Total, . .	54,466¼	43,846

which gives an excess in favour of the *labourer*, of

Carbon, . . .	10,057	grains.
Nitrogen, . . .	563¼	„
Total, . .	10,620¼	grains per week.

Comparing this result against the following table, calculated from the statistics given by Professor Lyon Playfair of other working classes of the United Kingdom with reference to carbon only, we find that

An English sailor consumes weekly	33,839¾	grains carbon.
„ navvy, .	35,218¾	„
Hard-worked weaver, .	42,007	„
Fully fed tailor, . .	35,983½	„
Blacksmith, . .	47,743½	„

giving an average of 38,972½ grains carbon weekly.

The quantity of carbon, however, according to Professor Lyon Playfair, necessary to maintain in good health and muscular activity a "*hard-worked*" British labourer, is 43,793¾ grains per week; and we, therefore, find that the dietary of the average

Scotch agricultural labourer contains, according to the foregoing table, nearly $\frac{1}{5}$th more carbon than the specified quantity; while the weekly consumpt of carbon by a Scotch agricultural *adult* is as nearly as possible the exact quantity which Professor Playfair states to be necessary for the support of an active (though not hard-worked) labourer, namely 41,958 grains per week.

This goes far to prove that the dietary of the Scotch agricultural population as a class, is better calculated to sustain a man in vigour and muscular health and strength, than the general articles of food daily consumed by the hard-working, low-fed population of other industrial occupations. The comparative death-rates of this class in the two countries, and of the agricultural districts in Scotland compared with the hard-worked classes of labourers and mechanics in town districts, amply verify these remarks.

Having thus considered what may be styled the national Scotch agricultural dietary, in relation to nutritive properties, and its comparative cheapness as against the dietary of English labourers and town tradesmen, we may carry the comparison still further, and place our Scotch average cost against that of the almost universal article of daily food amongst the poorer classes of the working population in Ireland—*Indian corn meal* or *maize*.

In this view we find that the average amount of nutritive food obtained from a given sum, by the rural population of Ireland, is considerably larger than even that of Scotland, and is twice as great as that of England. This startling fact is to be ascribed to the very general use made by the poorer classes of Indian corn meal, which is well known to possess excellent nutritious properties, and a very large proportion of carbonaceous and nitrogenous elements. In these particulars it may be said to be equal to oatmeal, and hence it is the difference in the market value of the two commodities which gives the total average of cost in favour of the Irish staple over that of Scotland.

	SCOTCH OATMEAL.		INDIAN CORN MEAL OR MAIZE.	
	Grains per lb.	Cost per lb.	Grains per lb.	Cost per lb.
Carbon, . . .	2800	...	2800	...
Nitrogen, . .	140	...	121	...
Total,	2940	1½d.	2921	1d.

The low-fed agricultural population of Scotland may be divided into four classes:—

1. Shepherds or ploughmen (married men), generally with

families, residing in cottages upon the farms which they are hired to cultivate, and engaged by the year or half year. Of this class and their average dietaries, good examples from different localities will be found in Appendix A, Cases Nos. 1, 2, 4, 8, 12, 24, 35, 36, 39, 43, &c.

2. Ploughmen, young men (unmarried), similarly engaged to Class 1, but sleeping in bothies on the farm, and boarding or victualling in their master's kitchen. Cases of this class will be found in Nos. 10, 48, 54, &c.

3. Field labourers (male and female) living either in separate cottages with married ploughmen's families as lodgers, or in bothies (where females only), and, in point of social condition, living similarly to Class I. Instances of this class are given in Cases Nos. 3, 20, 23, &c.

4. Occasional labourers employed in field-work, residing in their own rented houses, not necessarily upon the farm where they are employed, but frequently in adjacent villages or hamlets, and having sometimes to travel two or three miles daily to and from their work, and therefore carrying their mid-day meal or dinner with them, or having it carried by one of their family, to the scene of their occupation. Examples of this class occur in Cases 11, 22, 25, 26, 27, 32, 34, 37, 38, 55, &c.

Tabulating the weekly average amount of nutritive food consumed by these classes, we find—

	LABOURER.	FAMILY PER COMPUTED ADULT.
Class I. consume, .	54,467 grains	43,377¾ grains
„ II., . . .	68,633½ „	... ...
„ III. (Males), .	48,762 „	... ...
„ (Females), .	40,269½ „	... ...
„ IV. . . .	49,969 „	47,989 grains

Thus, as a rule, Class II. fare the best, and in many districts consume more regularly butcher meat as a daily article of food. They do not, however, remain long in their situations, chiefly owing to their dislike to the supervision exercised over them, and to the restraint laid upon their habits by their masters, as must be the case when these evince any interest in and care of those boarded under their roofs. This class is generally found throughout the northern and north-eastern counties, and chiefly in some of the districts of Aberdeenshire. Class I. may be subdivided into two sections,—1. Shepherds; 2. Ploughmen. Of these subdivisions the shepherds are the better fed; indeed they are a better paid class generally, if not the best paid portion of the agricultural population, and are frequently men of superior shrewdness and intelligence, and distinguished by

greater thrift than the other rural labouring classes in Scotland. Good examples of the class occur in cases 49 and 50. They are, of course, met with in those large sheep-tracts which abound in the Highlands and pastoral districts of Scotland, and may be regarded in point of dietary as considerably above the average of the Scotch peasant, and as occupying a position in that respect to which it would be very desirable to raise the ordinary run of ploughmen throughout the country. The other subdivision referred to (ploughmen) includes the great mass of the Scottish peasantry or hinds. This class is numerically stronger than the other sub-division of Class I. (shepherds), and Classes II. and IV. added together, and includes about 80 per cent. of the entire rural agricultural male labourers in Scotland. They are met with, under slightly varying phases of social condition and habits, throughout all the Scotch counties where the ploughshare is used, or arable land is found. We find them, as might be expected of a class so widely spread, under various systems of husbandry, and differing in many particulars as to wages, modes of payment, and terms of engagement; but throughout all the counties we find that their dietary is very much the same, differing only in minor points of detail, and almost universally composed of the staple of Old Scotland—oatmeal porridge and milk, or at least of oatmeal prepared in various ways and milk. With them the use of butcher meat, as an article of daily food, is unknown, and, unless in cases such as are cited in Nos. 4, 15, 16, 20, 33, &c., where a pig is allowed to be kept, they and their families seldom partake of animal food at all, unless in times of sickness or upon rare occasions.

Amongst this class the use of tea as a beverage is not so common, although rapidly creeping into daily use, as in the case of shepherds, or even in that of Classes III. and IV.; and, where it is indulged in, it is restricted chiefly to the labourer's wife, or used by the family upon Sundays; and we find its consumption is most general in Wigtownshire. (See Cases 53 and 55).

Much has been done of late years to improve and ameliorate the social condition and comfort of this class, and were the ploughmen, of their own accord, to advance proportionately in moral duties and in attention to sanitary measures for the comfort of their homes and families, their well-being as a class would be greatly augmented, and an additional stimulus given to landlords and tenants to extend to them still further a helping hand. Mere cry for larger wages, and combination against their masters, will never raise the status of the peasantry. Reasonable requests will never be refused by liberal and kindly-disposed masters, such as the Scottish tenant farmers generally are; and there seemed little need for the coercion upon this point which was recently attempted. The ploughmen must themselves prove their

desire and willingness, unaided if necessary, to improve their position, morally and socially, by a more conscientious and kindly interest in their master's well-being and the duties assigned to them, and by a more careful attention to the education of their children, and to inculcating in their families habits of frugality, cleanliness, and tidiness; and then, doubtless, the happiness and comfort of the rising generation of ploughmen will, when their day of labour reaches its meridian, outstrip those of their fathers.

It is much to be regretted that the old mode of paying this class of labourers, *to a great extent in kind*, is now becoming comparatively obsolete, through the more general custom of an almost exclusively money payment; for we maintain that no mere pecuniary remuneration will so satisfactorily, adequately, and comfortably support and aliment a ploughman and his family, as when certain defined perquisites (otherwise unattainable except as wages) are continued. Where a cow's keep is allowed, for instance, and is made part of the bargain between master and servant, or when permission to keep a pig is given, and is calculated as part of the wages, we find that not only are these privileges *not* productive of the petty jealousies and annoyances usually alleged against them, but that, in such cases, the well-being and dietary of the family is materially improved. This is abundantly evident in many of the cases cited in our appendix, and of which the following table affords conclusive proof, as showing the average number of grains of nutritive food consumed weekly by a labourer and his family when a cow is kept by them, as compared with the case of one where the permission to keep a cow does not exist.

	PLOUGHMAN, KEEPING A COW.		PLOUGHMAN, NOT ALLOWED A COW.	
	Labourer.	Family, per computed Adult.	Labourer.	Family, per computed Adult.
	Grains.	Grains.	Grains.	Grains.
Carbon, ...	52,047	37,410	33,694	24,616½
Nitrogen, ...	2,761¼	1,677	1,800¼	1,310
Total, . . .	54,808¼	39,087	35,494¼	25,926½

Classes III. and IV. are generally the worst fed of the rural population, and vary but little from each other in point of dietary. Socially and morally the condition of many of those designated under Class III. may be regarded as a blot upon the otherwise fair escutcheon of agriculture. Farm bothies occupied by single women employed as field-workers, frequently mere girls, without supervision, and under little or no control after working hours,

without almost any article of household furniture other than a mere pallet of straw, destitute of the proper means of cooking their scanty meals, dirty, and slovenly, are unfortunately too numerous in many rural districts. In the midst of so much destitution—so far as comfortable accommodation and arrangement are concerned—we may expect to find the poorest fare in daily use. Yet it is surprising to see how much, even in cases of this description, the national dietary does for the health of the labourer, and how much nutritive diet is obtained even under such adverse circumstances. As a class, however, the state of the bothy resident admits of much improvement, and no other mode seems to be so good, or so likely to attain this desired result, so far as their dietary is concerned, than the practice of more generally paying this class a considerable part of their wages *in kind*. This would go far to remedy many evils, and we could cite cases (No. 3, for example) where the benefits arising from partial payments *in kind* have been very decided. In the example referred to, the average weekly consumpt of nutritive food is 40,269½ grains per adult. It is objected to this proposal, that the recipients would simply "*sell*" the potatoes, milk, meal, or fuel so given them; but admitting that possibly some surplus portion may be so disposed of, we still think that a more liberal quantity will be reserved and consumed than is used under the money payment system, and most likely what is "sold" might be more properly said to be bartered for groceries or provisions of nutritious value. Those of Class IV., who occupy their own homes in villages or hamlets, are better off than those who lodge in or occupy bothies, and they have frequently other little comforts which go far to ameliorate their condition. In fact we find that, invariably throughout Scotland, *the family system* of living is much the best; and although, in married life, the ploughman's great "millstone" is often his "large small family," that grievance exists only for a time, for if the children's upbringing is

"Mixed wi' admonition due,"

and

"Their masters' and their mistresses' command
The younkers a' are warned to obey,
And mind their labours wi' an eident hand,"

he, by-and-by, finds them to become to him a "paying concern;" and in many of our returns the earnings of the family will be seen to be by no means inconsiderable.

We do not by this mean to recommend the *early* sending of the agricultural labourer's children to field-labour; such a practice is unfortunately much too prevalent, and the result is that the education of the rural youth of both sexes is by far too much neglected and stinted, and many of those branches (such as writing and

arithmetic), which would greatly aid them in after-life in raising themselves in the scale of social life, are, if overtaken at all, merely glanced at in a cursory manner. This mode, therefore, of increasing the income of a labourer's family is to be deprecated most strongly,—the price paid for such improvements in the dietary, by the premature earnings of the children, is a burden and mortgage over the whole family for the future, and is certain to result in moral degradation and deterioration. Nor should the labourer's wife regularly assist in outdoor occupations of the farm ; this may be all very well for a few weeks during harvest, or occasionally, when, through any emergency of the weather or lateness of the season, much additional assistance is required ; but it is better, if possible, to avoid withdrawing the mother of a family from her housekeeping and maternal duties, as it tends to detract from the comfort of the ploughman's home, and consequently from his dietary, and maintenance in full, healthy, and robust physical ability for labour.

Taking the average weekly requirement of nutritive food of a man to enable him barely to subsist and avert starvation, as 30,100 grains carbon, and 1400 grains nitrogen, and of a female, as 27,300 grains carbon, and 1260 grains nitrogen, we find that in none of the examples cited, nor in any of the returns we have obtained from any part of Scotland, mainland or insular, does the dietary of this country fall so low as these figures. Poor diets, we find, tell least upon those without families, and insufficient diet affects the wife and children more than the father of the family. This may be accounted for, either from the labourer being fed in his employer's house in some instances; or, having to work, he *must* eat, and thus comes in for a better share of the pittance allotted to the sustenance of his family's life. The size of the ploughman's family affects the variety and quantity of the diet.

It only remains for us now to notice one or two local peculiarities of dietary and social condition of the agricultural labourer, reported to us from different quarters. In Sutherlandshire, an article of pretty general use exists, called "crowdie." This is simply curded milk made into a sort of cheese, but not pressed in the cheese-press. It sells at 2½d. and 3d. per lb. In Skye, the use of shell-fish amongst the poor people is very general. In this district the subsistence of the low-fed population is very precarious. They may be well off the one month, and exceedingly poor the next. An ordinary labourer gets 1s. for ten hours' work, and a woman 6d., both without food. Employment is not regular, and they seldom work a full day. They have, however, little windfalls occasionally, and many go south to harvest and to public works. Yet throughout the island there is quite as little abject poverty as in any part of

Scotland. Poor-rates in Bracadale parish are 1s. 6d. per pound; but in some parts of the island, as in Sleat district, they are as high as 6s. per pound; and in these localities some extreme cases of poverty of diet occur.

In Leadhills district (Dumfriesshire) nearly all the villagers (miners) keep a cow each. These are grazed upon the "common" ground; and their owners unite yearly, and rent a piece of hill-pasture, for which they pay from £50 to £60 per annum, and upon which they raise hay for the winter's keep of their cows. This will cost, when allocated, about 15s. a-year per cow. Some of the villagers, in lieu of a cow, keep a few sheep.

In Lochfine district chiefly Irish labourers are employed. The bothy system principally prevails. One Irishman will work as much per day as two Highlanders. The Highlanders are generally poor, and cannot afford to send their children to trades. When they grow up they migrate to the lowlands of Scotland, where wages are higher, and readily find employment in public works, or as porters, and many as policemen. On their return home, some of those who have been engaged on railway works or other large public contracts, take to farm service, and make excellent workers. The Irish population come and go a good deal.

Throughout the various districts of Scotland, we find that, contrary to the custom in England, on Sundays when the family dietary is better and more liberal than usual, there is less cooking as a rule on that day in Scotland than on the other days of the week. The use of beer in Scotland as an article of general diet among the agricultural population is quite unknown.

In conclusion, we arrive at the following results from the foregoing inquiry:—

1. That the Scotch agricultural labourer and his family, as a class, are plainly but well fed.

2. That in all the districts of Scotland the average dietary is considerably above the amount necessary for the bare sustenance of life and vigour.

3. That the nutritive value of the average rural dietary in Scotland is very high, and considerably exceeds that of the dietaries of England and Ireland usually adopted by similar classes of the population.

4. That an equal amount of nutritive food is obtained by the Scotch peasant at less cost than by the English hind.

With the view of improving the dietary of the Scotch agricultural labourer and his family, we suggest—

1. That a more general use of pease meal (or dried pease), beans, and Indian corn meal mixed with potatoes, and taken as part of the usual diet, be adopted.

2. That where no butcher meat is obtainable, a larger quantity

of cheese than is at present used be consumed in lieu of animal food.

3. That to each rural labourer's family not less than a Scotch pint of sweet milk (3¼ imperial pints) be allowed daily; and that with a view to this most important article of food being regularly obtained, the quantity named should form part of the labourer's wages; or that instead of this allowance, a cow's keep and accommodation for a cow be allowed by the farmer.

4. That the payment of wages *in kind* should be continued, and that coals as well as meal and potatoes should form part of such payment by the masters.

5. That the money wages be paid weekly instead of half-yearly, or in partial monthly payments to account, as is at present the case on most farms in the Lothians and elsewhere.

6. That with the view of improving the cooking of the peasant's diet, besides the allowance of coals above referred to being given, each cottage should be provided by the landlord with a suitable "fixed in" grate for cooking, having a boiler attached; and where practicable, a small boiler should be erected for the use of each cottage, either for boiling food for their pig, or for domestic purposes other than cooking, so as to relieve the use of the kitchen fire.

7. That a larger piece of garden ground than is generally given should be allotted to each ploughman's cottage.

8. Unless special accommodation for the purpose be provided, cottagers should not be allowed to keep lodgers; for this practice defeats the efforts of the landlord to provide each family with requisite and sufficient "living space," the due and proper amount of which is absolutely necessary to the continued health and vigour of the cottager. If crowding and airlessness be permitted, filth and disease are engendered; and if this state of matters exists along with insufficient food, the low dietary then becomes the certain aggravator of a predisposition to disease.

APPENDIX *A*.

CAITHNESS-SHIRE.

1. Parish of Reay. *Shepherds.*—J. R. Family above ten years, 2; below, 3. Takes meals at home. Rent free. Yearly wages, £20 in money, 7 bolls meal, 30 to 60 chains potatoes, keep for 8 ewes and cow, 3 tons coals or 25 loads peats, and 3 pints sweet milk daily. Wages of family, one at 9d. and one at 1s. per day. When a cow is kept £2 a-year is deducted from wages; no pigs or poultry allowed.

Breakfast, brose at 5 A.M. before turning out, porridge and milk at 11 A.M., with tea or coffee afterwards; of family, porridge and milk or treacle at 9 A.M. *Dinner* with family at 6 P.M., potatoes and dried herrings, or potatoes

and fresh fish, or sometimes pork and meat. *Tea*, wife takes tea and oatcake at 4 P.M. *Supper* with family at 9 P.M., brose, and bread with butter, or porridge and milk or treacle. Health extremely good.

Remarks.—In this district farms on the sea-coast are often supplied with a boat, by which means the men supply themselves with fish from June to end of October. Where no boat is kept, they fish on the lochs. Where sheep are extensively kept, a few die during winter and spring, and these, though not fit for the market, are wholesome for use, and the ploughmen and work-people buy the mutton at 2d. to 3d. per lb. The shepherds are well paid, getting from £15 to £20 per annum, and the perquisites named. They are a very intelligent class, and remain long in the same situation.

2. PARISH OF REAY. *Ploughmen.*—G. C. Family above ten years, 4; below, none. Takes meals at home. Rent free. Yearly wages, £10 in money, 8 bolls meal, 60 chains potatoes, 3 tons coals, and 3 pints sweet milk daily. Wages of family, three at 1s. per day each. No cow, pig, or poultry allowed.

Breakfast, brose at 5 A.M. before starting to work, porridge and treacle at 11 A.M.; of family, porridge and milk or treacle. *Dinner* with family, potatoes and milk, or fish and potatoes, or potatoes and pork. *Tea*, none. *Supper* with family, brose or porridge and milk. Health very good.

Remarks.—Ploughmen with large young families are unable to buy beef or pork, and they frequently run into debt to the small country shopkeepers, and when the yearly term comes round they remove to some other situation, leaving the debt unpaid. When in need of a few shillings, they are in the habit of taking meal to the shopkeepers, getting from 60 to 75 per cent. of its value; and when they buy groceries it is quite common to pay for them in meal. They are a very sober class.

3. PARISH OF REAY. *Female Farm-workers.*—J. W. Unmarried. Takes meals at home. Rent free, and fire provided. Yearly wages, £6 in money, $4\frac{1}{2}$ bolls meal, and 2 pints milk daily. No cow, pig, or poultry allowed.

Breakfast, brose or porridge with milk or treacle. *Dinner*, potatoes and fish, or brose and milk. *Supper*, porridge and milk, or tea and bread, or bread and milk. Health very good.

Remarks.—This case is the usual diet of outworkers (female) on large arable farms in this district. They are chiefly accommodated in bothies, which require the master's supervision.

SUTHERLANDSHIRE.

4. PARISH OF GOLSPIE. *Shepherds.*—J. S. Family above ten years, 1; below, 2. Takes meals at home. Rent free, worth £4, 5s. per annum. Yearly wages, £19 in money, $6\frac{1}{2}$ bolls meal, $1\frac{1}{2}$ boll potatoes, and quart of sweet milk daily. Keeps a pig and poultry.

Breakfast, porridge and milk; of family, porridge and milk. *Dinner* with family, tea, with oat bread and fish, or oat bread and crowdie, or oat bread and eggs; and on Sundays, broth made of fresh meat, or salt pork and potatoes. *Supper* with family, porridge and milk, or potatoes and fish (salt herring), with milk or tea. Health very good.

Remarks.—When milk is scarce the children get treacle and water to their porridge, but it is observed that under this diet they soon lose flesh and are not nearly so lively, nor do they seem to thrive.

INVERNESS-SHIRE.

5. PARISH OF BRACADALE (SKYE). *Hind.*—A. M'A. Family above ten years, 3; below, 1. Takes meals at home. Rent free, worth £1, 10s. per annum. Yearly wages, £12. Keeps cow and poultry.

Breakfast, oatmeal porridge and milk, or potatoes and fish; of family,

oatmeal porridge and milk, or potatoes and fish. *Dinner* with family, oatmeal and potatoes with milk or coffee. *Supper* with family, oatcake, butter, and tea, or potatoes and milk. Health excellent.

Remarks.—This is the case of a hind in regular employment, and is a fair specimen of this class in this part of the Island of Skye.

6. Parish of Bracadale (Skye). *Labourer.*—A. M'P. Family above ten years of age, 4 ; below, 2. Takes meals at home in winter only, from home from spring till end of harvest. Rent £1. Weekly wages, 15s. ; idle in winter. Wages of family, 2s. 6d. per week all year. Keeps poultry only.

Breakfast, porridge and milk, when away—at home, potatoes and fish ; of family, potatoes and fish. *Dinner*, bread and coffee, or bread and cheese and piece of bacon, when away—at home, potatoes ; of family, potatoes. *Supper*, tea and bread when away—at home, potatoes or meal-brose, sometimes potatoes or fish ; of family, potatoes or meal-brose, sometimes potatoes and fish. Health fair.

Remarks.—This case represents the poorest class here. The labourer leaves his home for the south of Scotland in spring, where he is employed from April till end of harvest at any work he can find, generally on railway contracts and at harvest work. He returns about end of October. Several of his family are out at service.

7. Parish of Bracadale (Skye). *Labourer.*—K. C. Family over ten years, 2 ; below, 4. Takes supper only at home ; on Sundays, takes all his meals at home. Rent, £1, 10s. Weekly wages, 12s. Wages of family, 3s. per week. Keeps pig and poultry.

Breakfast, potatoes beat, and oatcake or oatmeal brose ; of family, potatoes. *Dinner*, oatmeal brose, or potatoes and oatcake ; of family, potatoes and fish. *Supper* with family, tea and oatmeal cake, or coffee and fish. Health—man, scrofulous ; family subject to cutaneous eruptions.

Remarks—This is the case of a dyker and drainer ; he earns as much as any of his class and occupation, and he lives at home all the year.

ABERDEENSHIRE.

8. Parish of Alford. *Ploughman.*—B. C. Family above ten years of age, 1 ; below, 3. Takes meals at home. Rent free. Yearly wages, £24. Wages of family, 9s. per week. Keeps pig and poultry.

Breakfast with family, porridge and milk ; sometimes tea or coffee and bread. *Dinner* with family, oatmeal brose and milk or vegetable broth and potatoes. *Supper* with family, bread and beer and cheese, or bread and milk, or potatoes and milk. Health very good.

Remarks.—The keeping of poultry is often the cause of differences between master and servants, and leads to removal from situations here. A cow is allowed in a few cases.

9. Parish of Alford. *Day Labourer.*—D. C. Family above ten years of age, 2 ; below, 2. Takes meals at home. Rent, £3. Weekly wages, 15s. Wages of family, 9s. per week. Keeps pig and poultry.

Breakfast with family at 6 A.M., porridge and milk ; sometimes tea or coffee with oatcake or wheaten bread, which is now a good deal used. *Dinner* with family at 12 noon, oatmeal brose and milk, or potatoes and milk, greens soup made with a small piece of meat occasionally. *Supper* with family, potato soup, or bread and milk, or bread and tea, or bread and beer with cheese. Health very good.

Remarks.—The use of butcher meat was increasing a good deal, till the present high price checked it in this district.

10. Parish of Oyne. *Ploughman.*—A. B. Unmarried. Takes meals at home. Rent free. Yearly wages, £22. Keeps no cow, pig, or poultry.

Breakfast, porridge and milk. *Dinner,* vegetable broth, with potatoes and cheese. *Supper,* brose or porridge, with milk and oatcakes. Health excellent.

Remarks.—This is the case of a hind who gets his meals in his master's kitchen. The small farmers here seldom get butcher-meat themselves. Some old people who live in cottages on the farms in this district often take oatcakes and tea to dinner.

11. Parish of Oyne. *Day Labourer.*—D. S. Family above ten years, 4. Rent, £2, 15s. Weekly wages, 15s.; wages of family, one at £2, 10s. a-year, two at £4 and £6 a-year. Keeps pig and poultry.

Breakfast with family, porridge or brose, with milk or beer. *Dinner* with family, potatoes with turnips or green kail, or porridge and milk. *Supper,* tea or coffee with oatcakes or loaf-bread; of family, porridge and milk. Health very good.

Remarks.—This is the case of a day-labourer. He takes his meals at home daily if working near his house; if employed at a distance, his meals are carried to him by his wife or one of his children.

12. Parish of Foveran. *Ploughman.*—W. B. Family above ten years, 1; below, 6. Rent, £3, including fire. Yearly wages, £12 in money, and 6½ bolls meal. Keeps cow, pig, and poultry.

Breakfast with family, oatmeal porridge and milk, or brose and milk. *Dinner* with family, oatmeal porridge and milk, or tea and fish and loaf-bread, or potatoes and milk. *Supper* with family, porridge and milk, or potatoes and milk. Health good.

Remarks.—When a cow's keep, say £8 per annum, is not allowed, milk from the farm-house is given, value say £4 per annum, the balance going to the ploughman's money wages.

13 Parish of New Deer. *Labourer.*—A. D. Family above ten years, 3; below, 6. Takes meals at home. Rent, £4 per annum. Weekly wages, 12s. during winter, 14s. during summer. Keeps no cow, pig, or poultry.

Breakfast, brose with molasses, or porridge and beer; of family, porridge and beer. *Dinner,* potatoes and milk, or sometimes herrings and potatoes, or kail brose, or oatcake and beer; of family, potatoes and milk. *Supper* with family, turnip brose or porridge and beer. Health good.

Remarks.—In this parish agricultural labourers fare very poorly. They sometimes purchase a barrel of the cheaper herrings, to be used with potatoes by the head of the family for dinner. Beef is never seen within their houses, nor is the luxury of tea indulged in.

14. Parish of St Nicholas. *Artisan occupied at Railway and Docks.*—W. B. Family above ten years, 1; below, 5. Takes meals at home. Rent, £2. Weekly wages, 13s.; wages of family, 2s. 6d. per week. Keeps no cow, pig, or poultry.

Breakfast with family, oatmeal porridge and milk. *Dinner* with family, potatoes with lard, and milk or oatbread. *Supper* with family, oatmeal porridge and milk; on Sundays, tea and wheaten bread and butter. Health good.

Remarks.—The diet in this case is rather inferior to and less varied than that of labourers here, but this is doubtless owing to the large family who are depending upon him for support.

KINCARDINESHIRE.

15. Parish of Banchory-Ternan. *Ploughman.*—W. S. Family above ten years, 1; below, 4. Takes meals at home. Rent, £3, 10s. Yearly wages, £17 in money, 6½ bolls oatmeal, and 2 pints sweet milk daily. Keeps pig and poultry.

Breakfast, porridge and milk; wife, tea and oatcake and butter; family,

porridge and milk. *Dinner* with family, potatoes with broth or pork, and milk and bread. *Supper* with family, porridge and milk, or tea and bread and butter. Health good.

16. Parish of Durris. *Ploughman.*—J. A. Family above ten years, 2; below, 4. Takes meals at home. Rent, £3. Yearly wages, £17 in money, 6½ bolls oatmeal, and 2 pints sweet milk daily. Keeps pig and poultry.

Breakfast, porridge and milk, or porridge and treacle; wife, tea and bread and butter; family, porridge and milk, or porridge and treacle. *Dinner* with family, pork broth and potatoes, or fish and potatoes, or milk and potatoes. *Supper* with family, potatoes and milk, or greens and tea and bread. Health very good.

PERTHSHIRE.

17. Parish of Crieff. *Ploughman.*—P. R. Family above ten years, 3; below, 2. Takes meals at home. Rent free, worth £6. Yearly wages, £27. Wages of family, two sons out at trades, who dine at home on Sundays. Keeps no cow, pig, or poultry.

Breakfast with family, porridge and milk; wife takes tea and bread and butter. *Dinner* with family, potatoes and broth, and boiled meat, of which broth is made, or herrings and potatoes, or dried white fish and potatoes; sometimes cheese and bread, and potatoes. *Tea*, wife takes tea, bread and butter. *Supper* with children, porridge and milk, or ham and potatoes and milk. Health good.

Remarks.—This is the case of a foreman ploughman, and thus above the average. Deduct £5 from the yearly wages, and the case is an average one.

18. Parish of Crieff. *Day labourer.*—J. C. Family above ten years, 2; below, none. Takes meals at home. Rent, £4. Weekly wages, 12s. Keeps no cow, pig, or poultry.

Breakfast with family, porridge and milk. *Dinner* with family, broth and meat used in it, say pork or beef, and potatoes and bread. *Tea*, only wife takes tea and bread and butter. *Supper* with family, cheese with bread and milk and butter. Health good.

Remarks.—This is the dietary of an ordinary day labourer, *i.e.*, a man working daily on the farm, but not fed in the farmer's house, and having no allowance, nor a house, nor living in a bothy. Such usually live in a cottage, for which they pay a yearly rent.

19. Parish of Muckart. *Ploughman.*—P. W. Family above ten years, 2; below, 3. Takes meals at home. Rent free. Yearly wages, £19 in money; meal, £6; potatoes, £2; milk, £1, 10s.—in all, £28, 10s. Cow, pig, or poultry, none.

Breakfast with family, porridge and milk. *Dinner*, broth of vegetables, bread and cheese or bread and bacon; family, broth and bread and butter. *Tea* with family, tea with bread and butter. *Supper* with family, porridge with treacle or milk. Health excellent.

FIFESHIRE.

20. Parish of Saline. *Ploughman.*—R. K. Family above ten years, 3; below, 1. Takes meals at home. Rent, £4. Yearly wages, £29, 17s. Family all at service. Keeps a pig.

Breakfast with family, porridge and milk, rarely tea and bread and butter. *Dinner* with family, broth and bacon and potatoes, or cheese, milk, and potatoes. *Tea* with family, tea with bread and butter. *Supper* with family; only in winter takes supper, potatoes, cheese, and milk. Health excellent.

Remarks.—Wages stated include the value of meal, milk, and potatoes. The ploughman's statutory allowance in this district of articles paid in kind is—6½ bolls meal per annum, 1 pint sweet milk daily or three chopins

skimmed milk, 4 bolls potatoes or a few pecks planted in place. In money, £17 to £20, according to proficiency.

21. Parish of Saline. *Ploughman.*—A. K. Unmarried. Takes meals at home. Yearly wages, £27, 7s.

Breakfast, porridge and milk. *Dinner*, broth and bacon and bread, or cheese, bread, and milk. *Tea* and bread. *Supper*, in winter only takes supper, bacon or cheese with bread and milk. Health excellent.

Remarks.—This is a fair average specimen of an unmarried ploughman of the district, who lodges with married men or in a separate cottage. His wages include the value of meal, milk, and potatoes.

22. Parish of Kinghorn. *Field Worker.*—D. D. Family above ten years, 1; below, none. Takes meals at home. Rent of house free, worth £3. Weekly wages, 12s.; wages of family, 6s. Keeps a pig.

Breakfast with family, porridge and milk, or brose. *Dinner* with family, broth with bacon and bread, or with cheese and bread. *Tea* with bread and butter. *Supper*, potatoes and milk or brose, or cheese and milk and bread. Health good.

Remarks.—Cattle feeders (male) get 6d per week extra, and potatoes £2, 10s. per annum. They generally live in a cottage or neighbouring village, and work on the farm as required. Get victuals during the harvest, porridge and milk for breakfast, beer and bread for dinner, and porridge and milk for supper.

23. Parish of Kinghorn. *Ploughman.*—W. V. Unmarried. Takes meals at home. Rent free. Yearly wages, £35, 10s.

Breakfast, brose or porridge and milk. *Dinner*, cheese or bacon and bread and milk. *Tea* and bread and butter. *Supper*, brose or porridge and milk, or potatoes and milk. Health good.

Remarks.—Live in bothies generally, and are strong and robust.

24. Parish of Kinghorn. *Ploughman.*—W. N. Family above ten years, 2; below, 4. Takes meals at home. Rent free, worth £3. Yearly wages, £35, 10s.; wages of family, 12s. per week. Keeps a pig.

Breakfast with family, porridge and milk. *Dinner* with family, broth and bread with pork, or cheese, or sometimes fish. *Tea* with bread and butter. *Supper* with family, porridge and milk in summer, potatoes and milk in winter. Health excellent.

Remarks.—Wages made up thus:—in money, £18; house and garden, £3; coals driven, £1, 16s.; harvest victuals, £1; potatoes, £2, 10s.; meal, £5, 4s.; milk, £4—in all, £35, 10s.

25. Parish of Kingsbarns. *Female Labourer.*—N. B. Family above ten years, 2; below, none. Takes meals at home. Rent £1, 10s. Weekly wages, 5s.; wages of family, one earns 5s. per week. Keeps a pig.

Breakfast with family, porridge and milk. *Dinner* with family, potatoes and herring, or pork broth and bread. *Tea* with butter and bread. *Supper*, none. Health excellent.

Remarks.—Very thrifty.

26. Parish of Kingsbarns. *Female Labourer.*—F. S. Family above ten years of age, 2; below, 1. Takes meals at home. Rent, £1, 10s. Weekly wages, 5s.; wages of family, one earns 5s. per week. Keeps a pig.

Breakfast with family, porridge and milk. *Dinner* with family, potatoes and herring, or pork broth and bread. *Tea* with bread and butter. No *supper*. Health good.

Remarks.—One child is at school.

27. Parish of Kingsbarns. *Female Labourer.*—J. S. Family above ten years of age, 1; below, 2. Takes meals at home. Rent, £1, 10s. Weekly wages, 5s. Keeps a pig.

Breakfast with family, porridge and milk. *Dinner* with family, potatoes and herring, or pork broth and bread. *Tea* with bread and butter. *Supper* none. Health good.

Remarks.—Children are at school. Very industrious.

28. Parish of Kingsbarns. *Female labourers.*—B. R. Family above ten years, 3; below, none. Takes meals at home. Rent, £1, 10s. per annum. Weekly wages, 5s.; wages of family, two at 5s. per week each. Keeps a pig.

Breakfast with family, porridge and milk. *Dinner* with family, potatoes and herring, or pork broth and bread. *Tea* with butter and bread. No *supper*. Health excellent.

29. Parish of Kingsbarns. *Ploughman.*—J. T. Family above ten years, 2; below, 4. Takes meals at home. Rent free, worth £2, 5s. per annum. Yearly wages, £30. Keeps a pig.

Breakfast, porridge and milk; family, porridge and milk, or tea and bread. *Dinner*, pork broth and potatoes; family, pork broth. *Tea* and bread with family. *Supper* with family, bread and milk. Health middling.

Remarks.—Dwelling-house is not very comfortable or good.

30. Parish of Kingsbarns. *Ploughman.*—A. A. Family above ten years, 2; below, 2. Takes meals at home. Rent free, worth £2, 5s. per annum. Yearly wages, £30. Keeps a pig.

Breakfast with family, porridge and milk. *Dinner* with family, pork broth and potatoes and bread. *Tea* and bread, with family. *Supper* with family, milk and bread. Health good.

Remarks.—Occupies a good house of two apartments, and garden plot attached, containing about 200 yards.

31. Parish of Kingsbarns. *Ploughman.*—D. W. Family above ten years, 4; below, 4. Takes meals at home. Rent free, worth £2, 5s. per annum. Yearly wages, £17 in money, 6½ bolls oatmeal, 8 bolls potatoes, and 14 gills sweet milk daily. Wages of family, four earn each 5s. per week. Keeps a pig.

Breakfast with family, porridge and milk. *Dinner* with family, pork broth with bread and potatoes. *Tea* and bread with family. *Supper* with family, bread and milk. Health excellent.

32. Parish of Kingsbarns. *Land Labourer.*—J. S. Family above ten years, 2; below, 2. Takes meals at home. Rent, £2, 5s. per annum. Weekly wages, 12s. Keeps a pig.

Breakfast with family, porridge and milk. *Dinner* with family, pork broth, potatoes, and bread. *Tea* and bread with family. *Supper* with family, milk and bread, or potatoes and milk. Health good.

Remarks.—A land labourer, not a yearly servant. In bad weather, if there is much broken time, his wages will be a little less, being only paid for working hours employed.

33. Parish of Kingsbarns. *Ploughman.*—J. G. Family above ten years, 4; below, 3. Takes meals at home. Rent free. Yearly wages, £30; wages of family, four at 5s. per week each. Keeps a pig.

Breakfast, porridge and milk; family, porridge and milk, or sometimes tea and bread. *Dinner* with family, pork broth with bread and potatoes. *Tea* and bread with family. *Supper* with family, potatoes and milk. Health excellent.

ARGYLESHIRE.

34. Parish of Tarbert (Lochfine). *Labourer.*—D. M'K. Family above ten years, 2; below, 3. Takes meals at home. Rent free; pays £2 a-year for cow's grass. Weekly wages, 13s. Keeps cow and poultry.

Breakfast with family, porridge and milk, and tea and bread afterwards. *Dinner* with family, bread and milk, or potatoes and milk, or herrings and potatoes, or braxy soup. Wife takes tea and bread. *Supper* with family, porridge and milk. Health very good.

Remarks.—This is a fair specimen of a Highland labourer in this district. He buys annually two cwt. of braxy at 5s. per cwt., and 100 herrings occasionally at 2s. per 120. In this district many Irish are employed, and each will do twice as much as a Highlander.

35. Parish of Tarbert (Lochfine). *Shepherd.*—D. S. Family above ten years, 5; below, 2. Takes meals at home. Rent, £3 per annum. Yearly wages, £26; wages of family, £29 per annum. Keeps a pig and poultry.

Breakfast, porridge and milk, and tea with oatcake and butter afterwards; family, porridge and milk. *Dinner* with family, braxy soup, or potatoes and milk, with sometimes a herring and oatcakes. *Supper* with family, porridge and milk. Health good.

36. Parish of Tarbert (Lochfine). *Ploughman.*—D. M. Family above ten years, none; below, 3. Takes meals at home. Rent, £2 per annum. Yearly wages, £23, 10s. in money, 6½ bolls meal, 12 bushels potatoes, and 1 pint skimmed milk daily.

Breakfast with family, tea and oatcakes. *Dinner* with family, herring and potatoes, or vegetable broth, or potatoes and milk. *Supper* with family, porridge and milk. Health very good.

STIRLINGSHIRE.

37. Parish of Muiravonside. *Labourer.*—J. D. Family above ten years, 2; below, 1. Does not take meals at home. Rent, £2 per annum. Weekly wages, 12s. No cow, pig, or poultry allowed.

Breakfast, porridge and milk; family, tea and bread, or porridge and milk. *Dinner*, broth and potatoes, with a small piece of meat or bacon boiled in the broth, and occasionally herring and potatoes; of family, the same. *Tea*, labourer takes none on week-days; family, tea with bread and butter. *Supper*, in summer, porridge and milk—in winter, potatoes and milk; family, none. Health good.

LINLITHGOWSHIRE.

38. Parish of Kirkliston. *Female Labourers.*—C. V., A. B., E. G., P. F., living together. Take meals at home. Rent free, worth £4 per annum. Weekly wages, 7s. each. No cow, pig, or poultry allowed.

Breakfast, brose, or porridge and treacle. *Dinner*, cheese and bread and butter, or broth, or porridge. *Tea* and bread. *Supper*, porridge and treacle. Health excellent.

Remarks.—This return is from a bothy. The inmates are chiefly Irish or Highland unmarried girls. They are employed all the year on the land, at 1s. 2d. per day when working. Have house free. Victuals in harvest, and coals driven free—a privilege rarely required, fire being kept up by pilfered paling stobs and railing, &c. General moral conduct good; but occasional quarrels amongst themselves lead to petty warfare and blows. Diet in harvest good, being porridge and milk, beer and bread, and porridge and milk to supper.

39. Parish of Kirkliston. *Ploughman.*—J. S. Family above ten years, 1; below, none. Takes meals at home. Rent free. Yearly wages, £34. Keeps a pig.

Breakfast, porridge and buttermilk; wife, tea and bread; child, bread and milk. *Dinner*, broth and beef; child, milk and bread. *Tea* and bread and butter with family. *Supper* with family, porridge and milk. Health good.

MID-LOTHIAN.

40. Parish of Ratho. *Ploughman.*—A. B. Family above ten years, 4; below, 2. Takes meals at home. Rent included in wages. Yearly wages, £26 per annum; wages of family, one at £4, 10s. Keeps a pig.

Breakfast, porridge and milk, or tea and bread and herrings; family, porridge and milk. *Dinner*, broth and beef; family, broth. *Tea* and bread and butter; family, none. *Supper*, bread and cheese; family, porridge and milk. Health good.

41. Parish of Kirkliston. *Railway Labourer.*—A. K. None of his family are at home. Breakfast and supper at home; takes all his meals at home on Sunday. Rent free. Weekly wages, 18s. Wife does not work. Keeps poultry.

Breakfast, tea and bread and butter. *Dinner*, before rinderpest made milk so scarce, he took milk and bread and cheese, now beer and bread and cheese; family, when at home, take broth and bread with beef or cheese. *Tea*, bread with tea, or broth, or porridge with milk, sugar, or beer; wife takes tea and bread. Health very good.

Remarks.—This labourer is employed as a "gaffer" on the railway.

42. Parish of Cramond. *Ploughman.*—J. W. No family. Takes meals at home. Rent free. Yearly wages, £34. No cow, pig, or poultry allowed.

Breakfast, porridge and milk. *Dinner*, vegetable broth, or beer and bread. *Tea* with bread and butter. *Supper*, porridge with milk or sugar. Health good.

Remarks.—In suburban parishes it is often difficult for the labouring classes to obtain a regular supply of milk, as the adjoining large towns consume the whole supply, either by contract or by giving a better price for the article.

HADDINGTONSHIRE.

43. Parish of Haddington. *Labourer.*—J. R. Family above ten years, 3; below, 2. Takes meals at home. Rent free. Weekly wages, 12s.; wages of family, 15s. Keeps cow and pig.

Breakfast with family, porridge and milk. *Dinner*, herrings and potatoes, or pork, broth, and bread, or bread, cheese, and milk. *Tea* and *supper* in one meal—parents, tea and bread and a piece of pork, or porridge and milk; family, porridge and milk. Health very good.

Remarks.—Where no cow is kept £5 to £6 is allowed in lieu thereof. No poultry are allowed. In East Lothian generally, the hind has £11 in money and a free house and garden, besides potatoes, barley, beans, and oatmeal.

PEEBLESSHIRE.

44. Parish of Eddleston. *Ploughman.*—D. B. Family above ten years, 2; below, 1. Takes meals at home. Rent free. Yearly wages, £20 in money, 8 stones barley, 128 stones potatoes, fuel carted free, and 3½ pints sweet milk daily. Keeps a pig.

Breakfast with family, porridge and milk, and tea and bread afterwards. *Dinner* with family, milk and potatoes, or broth and potatoes, and bacon occasionally. *Supper*, porridge and milk, or cheese and bread and milk; family, porridge and milk. Health good.

ROXBURGHSHIRE.

45. Parish of Castleton. *Labourer.*—R. N. Family above ten years, 1; below, 2. Takes meals at home. Rent £2, 10s. per annum. Weekly wages, 15s. Keeps cow and poultry.

Breakfast, porridge and milk, and tea with bread and butter; family the

same. *Dinner* with family, broth and potatoes and bacon, or cheese and milk and bread and butter. *Supper*, potatoes and milk and bread, or tea with bread and butter. Health excellent.

LANARKSHIRE.

46. Parish of Crawford. *Miners employed at Leadhills.*—J. R. Family above ten years, 2; below, 6. Takes meals at home. Rent free. Weekly wages, average from 10s. to 20s. as the bargain turns out. Keeps a cow, pig, and poultry; sometimes keeps two or three sheep and no cow.

Breakfast, tea, bread, and butter, with cheese or a herring; family, porridge and milk. *Dinner*, tea with ham or bacon and eggs, or broth and piece meat; family the same. Tea with bread and butter; family, porridge and milk. No *supper* when tea is taken. Health good.

Remarks.—The health of young men and middle-aged is pretty good generally, but that of old men is not at all robust. Tea is very much used by this class at all diets. It would be better for them if more substantial food were more used. The piece of common grass land for grazing, belonging to the villagers, admits of their keeping cows easily; some, however, instead of a cow, graze two or three sheep.

47. Parish of Crawford. *Drainers and Outworkers.*—P. A. Family above ten years, 2; below, 2. Takes breakfast and supper at home daily; dinner at home on Sundays only. Rent £2, 10s. per annum. Weekly wages, 15s.; wages of family, 6s. per week. Keeps cow, pig, and poultry.

Breakfast with family, porridge and milk, or tea with bread and butter, and cheese. *Dinner*, milk with bread and butter, and a piece of cheese; family, broth, bread, and a piece of pork; sometimes tea, bread and butter. *Supper*, porridge and milk, or beat potatoes and milk; family, porridge and milk. Health good.

Remarks.—This district not being an arable agricultural one, there are few field-workers employed. The case stated is that of a drainer, of which class there are a good number employed. Few women are employed for field labour here; their diet where employed is the same as the case given.

48. Parish of Crawford. *Ploughman.*—P. S. Unmarried. Takes meals daily in master's kitchen. No rent. Yearly wages, £20. Keeps no cow, pig, or poultry.

Breakfast, porridge and milk, with bread and milk afterwards. *Dinner*, broth or potato soup, with meat and potatoes, and bread. *Supper*, porridge and milk, with bread and milk; sometimes meat, potatoes, and milk. Health very good.

Remarks.—There are very few married ploughmen in this district; the farms are principally sheep farms. The shepherds are always married men. The unmarried ploughmen board and lodge in the farm-house.

49. Parish of Crawford. *Shepherd.*—J. N. Family above ten years, 2; below, 4. Takes meals at home. Rent free. Yearly wages, paid chiefly in kind, worth £30 a-year, 10 bolls potatoes, 65 stones oatmeal, 8 tons coals. Keeps cow, pig, and poultry.

Breakfast with family, porridge and milk, and tea with bread and butter afterwards. *Dinner* with family, bread, butter, milk, and cheese; broth or potato soup, with a piece of salt meat or pork and potatoes. *Supper* with family, tea and bread and butter, or porridge and milk. Health very good.

Remarks.—The shepherd's wages vary, being 40 to 50 sheep when paid in sheep only, or 65 stones oatmeal, and £30 in money and cow's keep. Sometimes two cows allowed per annum, and 10 bolls potatoes of 4 cwt. to the boll.

DUMFRIESSHIRE.

50. Parish of Middlebie. *Shepherd.*—W. A. Family above ten years, 4; below, 1. Takes meals at home. Rent free, worth £3 per annum. Yearly wages, £30; wages of family, three are at service. Keeps cow, pig, and poultry free of charge.

Breakfast with family, oatmeal porridge and milk, or milk and bread. *Dinner* with family, potatoes, butter, and milk, and often inferior mutton. *Tea*, with bread and butter. *Supper* with family, oatmeal porridge and milk. Health good.

Remarks.—This labourer is a shepherd, a class better paid than the average labourers on farms in the district.

51. Parish of Middlebie. *Ploughman.*—J. R. Family all out at service. Takes meals at home. Rent free, worth £4 per annum. Wages, 11s. per week, say £28 per annum. Keeps a pig.

Breakfast, oatmeal porridge and milk. *Dinner*, coffee and bread. *Tea* and bread. *Supper*, none. Health good.

This man is employed as a ploughman.

52. Parish of Middlebie. *Out-door Female Workers.*—E. B., A. C. Take meals at home. Rent free. Weekly wages, 6s. each. No cow, pig, or poultry allowed.

Breakfast, tea and bread, or brose. *Dinner*, coffee and bread. Tea and bread or brose, or porridge and milk. Health good.

WIGTOWNSHIRE.

53. Parish of Newton-Stewart. *Ploughman.*—P. N. Family above ten years, 2; below, 2. Takes meals at home. Rent free. Yearly wages, £21 in money, 5 bolls meal, and 4 bolls potatoes. Keeps a pig.

Breakfast, porridge and milk, and tea and oatmeal cake after it; family, porridge and milk. *Dinner*, frequently tea and oatcake and butter, or potatoes and herring and milk, or broth of vegetables and a little suet; family, the same. *Supper*, porridge and milk, or tea with oatcake and butter; family, porridge and milk. Health very good.

Remarks.—Tea and oatcake and butter is frequently the diet of husband and wife at all the three meals daily.

54. Parish of Newton-Stewart. *Single Labourers, Male and Female, living in their Masters' Houses.*—A. W. Takes meals at home. Wages not specified.

Breakfast, porridge and sweet milk and oatcake, and milk afterwards. *Dinner*, broth with meat (bacon chiefly) and potatoes, oatcake and milk afterwards. *Supper*, porridge and milk. Health excellent.

Remarks.—This is the best fed class of the agricultural population in this district.

55. Parish of Newton-Stewart. *Field Workers.*—J. L. Family above ten years, 3; below, 3. Takes meals at home. Rent, £3 per annum. Weekly wages, 15s. Keeps pig and poultry.

Breakfast, tea with oatcake and butter; family, sometimes porridge and milk, and frequently tea, oatcake, and butter. *Dinner*, husband, penny loaf of wheat flour and cheese or butter to it, and milk or cold tea as "sap;" family, tea and oatcake. *Supper* with family, tea with oatcake and butter, or porridge and milk. Health very good.

Remarks.—In this class tea forms a part, if not the principal part, of every diet.

AYRSHIRE.

56. Parish of Kilmaurs. *Ploughman.*—J. S. Family above ten years, 2; below, 4. Takes meals at home. Rent free. Yearly wages, £21 in money, 5 bolls oatmeal, 5 bolls potatoes, 1 pint (Scots) sweet milk daily, and fuel driven. No cow, pig, or poultry allowed.

Breakfast, porridge and milk, and sometimes tea and oatcake afterwards; family, porridge and milk. *Dinner* with family, oatcake and vegetable broth and potatoes, or milk, cheese, and oatcake. *Tea*, wife takes tea and oatcake. *Supper*, porridge and milk or tea with oatcake and butter, or milk and bread; family, bread and milk, or porridge and milk. Health excellent.

APPENDIX *B.*

PROBABLE WEEKLY CONSUMPT OF FOOD.

CAITHNESS-SHIRE.

1. Parish of Reay. J. R.—*Description of Food.—Labourer:* Breadstuffs (including bread, rice, flour, barley, pease, &c), 3 lbs.; oatmeal, 9 lbs.; fish, 3 lbs.; meat or bacon, 1 lb.; butter, 4 ozs.; sugar (or treacle), 8 ozs.; potatoes, 7 lbs.; tea, 1 oz.; coffee, 1 oz. Total, 23 lbs. 14 ozs. Milk, 7 imperial pints. *Family:* Breadstuffs as above, 6 lbs.; oatmeal, 16 lbs.; fish, 1 lb.; meat or bacon, 1 lb.; butter, 1 lb.; sugar (or treacle), 1 lb.; potatoes, 20 lbs.; tea, 1 oz. Total, 46 lbs. 1 oz. Milk, 14 imperial pints.

Remarks.—This family may be taken as labourer and $2\frac{1}{2}$ adults.

Abstract.—Labourer, 52,047 grs. carbon, $2761\frac{1}{4}$ grs. nitrogen. Total, 54,808 grs. per week. Family per adult, 37,410 grs. carbon, 1677 grs. nitrogen. Total, 39,087 grs. per week.

2. Parish of Reay. G. C.—*Description of Food.—Labourer:* Oatmeal, 10 lbs.; fish, 1 lb.; bacon, 8 ozs.; sugar (or treacle), 4 ozs.; potatoes, 10 lbs. Total, 21 lbs. 12 ozs. Milk, 7 imperial pints. *Family:* Oatmeal, 15 lbs.; fish, 1 lb.; bacon, 1 lb.; sugar (or treacle), 4 ozs.; potatoes, 20 lbs. Total, 37 lbs. 4 ozs. Milk, 14 imperial pints.

Remarks.—This family may be reckoned as four adults in all.

Abstract.—Labourer, 43,892 grs. carbon, $2204\frac{1}{4}$ grs. nitrogen. Total, $46,096\frac{1}{4}$ grs. per week. Family per adult, $23,979\frac{1}{2}$ grs. carbon, $1166\frac{2}{3}$ grs. nitrogen. Total, $25,146\frac{2}{3}$ grs. per week.

3. Parish of Reay. J. W.—*Description of Food.—Labourer:* Breadstuffs (including bread, rice, flour, barley, pease, &c.), 3 lbs.; oatmeal, 5 lbs.; fish, 8 ozs.; sugar (or treacle), 4 ozs.; potatoes, 12 lbs.; tea, 1 oz. Total, 20 lbs. 13 ozs. Milk, 14 imperial pints.

Abstract.—Labourer, $38,283\frac{1}{2}$ grs. carbon, 1986 grs. nitrogen. Total, $40,269\frac{1}{2}$ grs. per week.

SUTHERLANDSHIRE.

4. Parish of Golspie. J. S.—*Description of Food.—Labourer:* Oatmeal, 7 lbs.; fish, 1 lb. 8 ozs.; meat, 8 ozs.; butter, 2 ozs.; cheese or crowdie, 6 ozs.; sugar (or treacle), 4 ozs.; green vegetables, 8 ozs.; potatoes, 7 lbs.; tea, 1 oz.; coffee, $\frac{1}{4}$ oz. Total, 17 lbs. $5\frac{1}{4}$ ozs. Milk, 2 quarts 1 pint; soup or broth, 1 pint imperial. Total, 2 quarts 2 pints imperial. *Family:* Oatmeal, 11 lbs.; fish, 1 lb. 4 ozs.; Meat, 8 ozs.; butter, 4 ozs.; cheese or crowdie, 4 ozs.; sugar (or treacle), 4 ozs.; green vegetables, 6 ozs.; potatoes, 10 lbs.; tea, $1\frac{1}{4}$ oz.; coffee, $\frac{1}{4}$ oz. Total, 23 lbs. $15\frac{1}{2}$ ozs. Milk, 4 quarts 1 pint; soup or broth, 2 pints imperial. Total, 4 qrts. 3 pints imperial.

Remarks.—This family may be taken as labourer and two adults.

Abstract.—Labourer, 33,694 grs. carbon, $1800\frac{1}{4}$ grs. nitrogen. Total,

35,494¼ grs. per week. Family per adult, 24,616½ grs. carbon, 1310 grs. nitrogen. Total, 25,926½ grs. per week.

INVERNESS-SHIRE.

5. Parish of Bracadale. A. M'A.—*Description of Food.—Labourer and Family:* Oatmeal, 17 lbs. 8 ozs.; fish, 5 lbs.; sugar (or treacle), 1 lb. 8 ozs.; potatoes, 26 lbs.; tea, 1 oz.; coffee, 2 ozs. Total, 50 lbs. 3 ozs. Milk, 63 imperial pints.

Remarks.—The articles consumed are chiefly grown by the family. When potatoes are in use, say from August to March inclusive, little or nothing else is consumed, unless occasionally a little fish. During the summer months, oatmeal is almost exclusively the staple food, with occasionally a little tea or coffee added by some families, but this is not general. Meat and butter are so little used, that it is not deemed worth while estimating these quantities, being quite infinitesimal.

Family taken as three adults.

Abstract.—28,997¾ grs. carbon, 1973½ grs. nitrogen. Total, 30,971¼ grs. per week per adult.

ABERDEENSHIRE.

14. Parish of St Nicholas. W. B.—*Description of Food.—Artisan Labourer and Family* (occupied at Railway Station and Docks): Breadstuffs (bread), 4 lbs.; oatmeal, 28 lbs.; butter, 8 ozs.; sugar (or treacle), 1 lb.; potatoes, 63 lbs.; tea, 2 ozs. Total, 96 lbs. 10 ozs. Milk, 14 imperial quarts.

Remarks.—In this case we have been unable to obtain separate returns of the weekly consumpt of labourer and his family.

Family in all may be taken as 3½ adults.

Abstract.—44,380 grs. carbon, 2009 grs. nitrogen. Total, 46,389 grs. per week per adult.

KINCARDINESHIRE.

15. Parish of Banchory-Ternan. W. S.—*Description of Food.—Labourer:* Breadstuffs (including bread, rice, flour, barley, pease, &c.), 4 lbs.; oatmeal, 10 lbs.; fish, 1 lb.; bacon, 1 lb.; butter, 6 ozs.; sugar (or treacle), 8 ozs.; green vegetables, 3 lbs.; Potatoes, 8 lbs. 8 ozs.; tea, 1 oz. Total, 27 lbs. 7 ozs. Milk, 3 quarts; soup or broth, 1 quart 1 pint imperial. Total, 4 quarts 1 pint imperial. *Family:* Breadstuffs as above, 6 lbs. 8 ozs.; oatmeal, 12 lbs.; fish, 1 lb. 8 ozs.; butter, 10 ozs.; sugar (or treacle), 1 lb. 8 ozs.; green vegetables, 5 lbs.; potatoes, 10 lbs. 8 ozs.; tea, 1½ oz. Total, 37 lbs. 11½ ozs. Milk, 6 quarts; soup or broth, 2 quarts 1 pint imperial. Total, 8 quarts 1 pint imperial.

Remarks.—This family may be taken as labourer and 2½ adults.

Abstract.—Labourer, 56,431 grs. carbon, 3746½ grs. nitrogen. Total, 60,177½ grs. per week. Family per adult, 25,038 grs. carbon, 1899 grs. nitrogen. Total, 26,937 grs. per week.

16. Parish of Durris. J. A.—*Description of Food.—Labourer:* Breadstuffs (including bread, rice, flour, barley, pease, &c.), 4 lbs.; oatmeal, 11 lbs.; fish, 1 lb.; butter, 6 ozs.; sugar (or treacle), 8 ozs.; green vegetables, 3 lbs.; potatoes, 8 lbs.; tea, 1 oz. Total, 27 lbs. 15 ozs. Milk, 3 quarts.; soup or broth, 1 quart imperial. Total, 4 quarts imperial. *Family:* Breadstuffs as above, 10 lbs.; oatmeal, 16 lbs.; fish, 2 lbs. 8 ozs.; butter, 1 lb., sugar (or treacle), 2 lbs.; green vegetables, 7 lbs.; potatoes, 16 lbs.; tea, 2 ozs. Total, 54 lbs. 10 ozs. Milk, 8 quarts; soup or broth, 3 quarts imperial. Total, 11 quarts imperial.

Remarks.—This family may be taken as labourer and three adults.

Abstract.—Labourer, 54,074 grs. carbon, 2619 grs. nitrogen. Total, 56,693 grs. per week. Family per adult, 34,208¾ grs. carbon, 1609½ grs. nitrogen. Total, 35,818¼ grs. per week.

PERTHSHIRE.

17. Parish of Crieff. P. R.—*Description of Food.—Labourer and Family:* Breadstuffs (including bread, rice, flour, barley, pease, &c.), 14 lbs.; oatmeal, 17 lbs. 8 ozs.; fish, 2 lbs.; Meat, 3 lbs.; bacon, 2 lbs.; butter, 1 lb.; cheese, 1 lb.; sugar (or treacle), 1 lb. 4 ozs.; green vegetables, 4 lbs.; potatoes, 8 lbs.; tea, 2 ozs. Total, 55 lbs. 14 ozs. Milk, 21 pints; soup or broth, 21 pints imperial. Total, 42 pints imperial.

Remarks.—2 lbs. of wheat flour bought weekly. Barley meal and oatmeal used alternately, not together. Fish used occasionally to supper.

Family taken as three adults (including father, mother, one child above 10, and two below 10 years old).

Abstract.—43,814 grs. carbon, 2522½ grs. nitrogen. Total, 46,336½ grs. per week per adult.

Note.—This is a *fair average* case of the ploughmen of the district, and is given as consumpt of man, wife, and three children (two under 10 years old). The bothy, or single man, often sells part of his meal, and is said to buy bacon or cheese with the proceeds.

18. Parish of Crieff. J. C.—*Description of Food.—Labourer and Family:* Breadstuffs (including bread, rice, flour, barley, pease, &c.), 8 lbs.; oatmeal, 14 lbs.; meat or bacon, 6 lbs.; butter, 2 lbs.; cheese, 1 lb.; sugar (or treacle), 1 lb.; green vegetables, 3 lbs.; potatoes, 6 lbs.; tea, 2 ozs. Total, 41 lbs. 2 ozs. Milk, 14 pints; soup or broth, 14 pints imperial. Total, 28 pints imperial.

Remarks.—Butcher meat, chiefly bacon, and used in making broth.

Family in all taken as 2½ adults (including father, mother, and one child above 10 years old).

Abstract.—46,233½ grs. carbon, 2051⅓ grs. nitrogen. Total, 48,284$_{1}^{7}$ grs. per week per adult.

19. Parish of Muckart. P. W.—*Description of Food.—Labourer and Family:* Breadstuffs (including bread, rice, flour, barley, pease, &c.), 37 lbs.; oatmeal, 14 lbs.; bacon, 2 lbs.; butter, 1 lb.; cheese, 1 lb.; sugar (or treacle), 1 lb.; green vegetables, 3 lbs.; potatoes, 14 lbs.; tea, 2 ozs. Total, 73 lbs. 2 ozs. Milk, 7 pints; soup or broth, 7 pints imperial. Total, 14 pints imperial.

Remarks.—Family in all taken as three adults (including labourer, wife, and three children under 10 years of age).

Abstract.—50,791¼ grs. carbon, 2258½ grs. nitrogen. Total, 53,049¾ grs. per week per adult.

ARGYLESHIRE.

35. Parish of Tarbert (Lochfine). D. S.—*Description of Food.—Labourer:* Breadstuffs (including bread, rice, flour, barley, pease, &c.), 2 lbs. 8 ozs.; oatmeal, 8 lbs.; fish, 1 lb. 8 ozs.; butter, 8 ozs.; sugar (or treacle), 8 ozs.; green vegetables, 2 lbs. 6 ozs.; potatoes, 22 lbs.; tea, 1 oz. Total, 37 lbs. 7 ozs. Milk, 7 imperial quarts. *Family:* breadstuffs as above, 8 lbs. 8 ozs.; oatmeal, 3 lbs.; fish, 3 lbs. 8 ozs.; butter, 1 lb. 8 ozs.; sugar (or treacle), 1 lb.; green vegetables, 4 lbs. 4 ozs.; potatoes, 78 lbs.; tea, 2¼ ozs. Total, 108 lbs. 14¼ ozs. Milk, 14 imperial quarts.

Remarks.—This family to be taken as labourer and three adults.

Abstract.—Labourer, 58,867 grs. carbon, 2851½ grs. nitrogen. Total, 61,718½ grs. per week. Family per adult, 23,724 grs. carbon, 1615½ grs. nitrogen. Total, 25,339½ grs. per week.

STIRLINGSHIRE.

37. Parish of Muiravonside. J. D.—*Description of Food.—Labourer and Family:* Breadstuffs (including bread, rice, flour, barley, pease, &c.)

18 lbs.; oatmeal, 15 lbs.; fish, 1 lb.; meat, 3 lbs.; bacon, 1 lb.; butter, 1 lb. 4 ozs.; cheese, 1 lb.; sugar (or treacle), 1 lb. 6 ozs.; green vegetables, 3 lbs.; potatoes, 16 lbs.; tea, 3 ozs. Total, 60 lbs. 13 ozs. Milk, 11 pints; soup or broth, 9 pints imperial. Total, 20 pints imperial.

Remarks.—The quantities may vary slightly with the season of the year, but they are a fair specimen of the mode of living in this locality.

This family may be taken as three adults in all.

Abstract.—47,286⅓ grs. carbon, 2068⅓ grs. nitrogen. Total, 49,354⅔ grs. per week per adult.

HADDINGTONSHIRE.

43. Parish of Haddington. J. R.—*Description of Food.—Labourer:* Breadstuffs (including bread, rice, flour, barley, pease, &c.), 4 lbs.; oatmeal, 7 lbs.; fish, 1 lb.; bacon, 2 lbs.; butter, 8 ozs.; cheese, 4 ozs.; sugar (or treacle), 4 ozs.; green vegetables, 3 lbs.; potatoes, 22 lbs.; tea, 1 oz. Total, 41 lbs. 1 oz. Milk, 7 pints; soup or broth, 10 pints; beer (in harvest only), 7 quarts imperial. Total, 7 quarts 17 pints imperial. *Family:* breadstuffs as above, 6 lbs.; oatmeal, 20 lbs.; fish, 1 lb.; bacon, 3 lbs.; butter, 1 lb.; cheese, 6 ozs.; sugar (or treacle), 1 lb.; green vegetables, 8 lbs.; potatoes, 78 lbs.; tea, 2 ozs. Total, 120 lbs. 8 ozs. Milk, 18 pints; soup or broth, 25 pints imperial. Total, 43 pints imperial.

Remarks.—Occasionally a quartern-loaf is used, but generally scones of fine flour; sometimes, but rarely, barley-and-pease meal. Herrings, salt, fresh, or dried only, used generally. Meat very rarely indulged in. Pig killed twice a-year, and *all* used in the house. Butter is sparingly used; bacon gravy used instead of it.

Family taken as labourer and four adults.

Abstract.—Labourer, 63,659 grs. carbon, 2627 grs. nitrogen. Total, 66,386 grs. Family per adult, 41,217¾ grs. carbon, 1322 grs. nitrogen. Total, 42,539¾ grs. per week.

Note.—During the five weeks of harvest, the hind, and those of his family who choose to work, have porridge and milk twice a-day, and bread and beer once. The boys who work get men's meals and boys' wages!

In this instance there is abundance of milk, as a cow is kept by the family; but in the majority of East Lothian cases no cow is now allowed to be kept by the hinds, and where this occurs, add £6 to the money wages per annum.

PEEBLESSHIRE.

44. Parish of Eddleston. D. B.—*Description of Food.—Labourer and Family:* Breadstuffs (including bread, rice, flour, barley, pease, &c.), 9 lbs.; oatmeal, 24 lbs.; bacon, 2 lbs.; butter, 8 ozs.; cheese, 2 ozs.; sugar (or treacle), 1 lb. 8 ozs.; potatoes, 14 lbs.; tea, 2 ozs. Total, 51 lbs. 4 ozs. Milk, 22 pints; soup or broth, 12 pints imperial. Total, 34 pints imperial.

Remarks.—Family taken as 2½ adults in all.

Abstract.—41,906⅔ grs. carbon, 2246¾ grs. nitrogen. Total, 44,153$_{2}^{7}{}_{0}$ grs. per week per adult.

ROXBURGHSHIRE.

45. Parish of Castleton. R. N.—*Description of Food.—Labourer and Family:* Breadstuffs (including bread, rice, flour, barley, pease, &c.), 21 lbs.; oatmeal, 14 lbs.; bacon, 3 lbs.; butter, 1 lb.; cheese, 8 ozs.; sugar (or treacle), 1 lb.; potatoes, 28 lbs.; tea, 2 ozs. Total, 68 lbs. 10 ozs. Milk, 21 pints; soup or broth, 14 pints imperial. Total, 35 pints imperial.

Remarks.—Family taken as three adults in all.

Abstract.—45,750½ grs. carbon, 1851½ grs. nitrogen. Total, 47,602 grs. per week per adult.

REPORT ON FOOT-ROT IN SHEEP.

By Hugh Borthwick, Shepherd, Middlestead, Selkirk.

[*Premium—Five Sovereigns.*]

Foot-rot is a disease prevailing to a greater or less extent over most of the pastoral districts of Scotland. On hill pasture it is always confined to what is termed soft or grassy land. On hard heathery pasture it is never known to exist. On arable land it appears on young grass, if very rich and luxuriant; but upon rich old pastures and lawns the disease prevails to a great extent. This fact is particularly exemplified in gentlemen's home farms, where the parks have been long in pasture, partly owing to the land being in better heart, as it is termed, and, generally speaking, from being lighter stocked, and surrounded with trees and plantations, so that the grasses rush up more luxuriantly, and are of a soft, watery nature. We don't know of a more fruitful nursery for the propagation of foot-rot than in some gentlemen's approaches, thickly planted with trees. Foot-rot is always confined to the foot, and although not fatal if properly treated, still there is no disease to which sheep are subject so difficult to eradicate, and so annoying to stock and the stock-farmer, if allowed to establish itself throughout a flock. Emaciation and poverty are the natural consequences, causing a great loss to the owner. It is one of the most essential points in stock-farming to keep the sheep in good condition; but if foot-rot is allowed to establish itself throughout a flock, this is impossible, let them be ever so liberally fed.

Symptoms.—The first indication of the disease is a certain degree of lameness in one or sometimes more of the feet; generally the fore feet are most liable to be affected. As the disease advances the lameness increases, if the animals are not treated or removed to other pasture. Ultimately they become totally unable to put the affected feet to the ground, but crawl about on their knees, pining away to skin and bone, and presenting a very distressing spectacle. It is not easy to say what part of the foot is most liable to be first affected, but there is a difference between sheep grazing on the hill pasture and on old arable pasture. On the former the disease is generally confined to sheep two years old and upwards, old ewes being most liable to it; whereas upon arable or old grass parks we have seen whole flocks seriously affected and deteriorated in value. Upon hill pasture, if the animal is caught in the first stage of the disease and examined, by putting the finger between the hoof, the foot is found to be unusually hot, and generally a little enlarged. The crust or horn along the outside of the foot and near the toe is found either to lap over the sole, or part of it is broken away and separated from the hoof, in which particles of earth or filth are accumulated;

consequently inflammation ensues and progresses rapidly. As the disease increases, ulcers are formed, which separate the hoof more and more, discharging a thin fœtid matter, emitting a strong smell, and by degrees the foot becomes a total mass of ulcers and proud flesh. In other cases, the disease breaks out in the inside of the toe, and progresses beneath the horn around the outside of the foot; and sometimes the heel is first affected. In parks where the pasture is soft and rank, the disease assumes the same appearance in old sheep as upon hill pasture; but in hogs and lambs it generally commences between the hoofs near the heel, the crust or horn being comparatively sound. In these cases, when the animal is caught and examined in the first stage of the disease, the skin presents a red and tender appearance, and has much the same aspect as what is termed *scad* in the young child. As the disease advances the flesh becomes putrefied, and a thick adhesive matter accumulates. By degrees the malady extends round the heel beneath the horn, till the whole foot is affected; and if allowed to run its course for a length of time, a cure is seldom effected till the whole crust is taken off on the side of the foot affected. In such cases, if the disease is not checked and energetically treated, it spreads rapidly through a flock of lambs, and very often the whole four feet are attacked at the same time.

Causes.—It is evident to the practical stocksman that the cause of foot-rot in sheep is attributable to the soil and pasture. For example, we have never known a case occur on the hard mountainous districts of Peeblesshire, Selkirkshire, or Argyleshire; but on very soft, grassy land, it abounds in every county that we are acquainted with. It prevails to a great extent among the flocks in the fine grassy pastoral ranges of Roxburghshire and Dumfriesshire; and even on some rich pastoral farms in Peeblesshire it exists to a greater or less extent; whereas upon hard, heathery farms, lying contiguous, it is unknown, although the sheep are daily intermixing. Certain seasons have great influence in propagating the disease. For instance, the wet summer of 1862 was noted for its prevalence. In no former year do we remember it having been so general, breaking out, as it did, on some farms where it was never known to exist before. Again, some persons of practical experience maintain that it is always worst in a dry season; and in support of this theory they point to the fact, that diseased sheep are always more lame on a dry day. There is, no doubt, some truth in the statement, but it can easily be accounted for on a common sense view of the case. When the foot is diseased and tender, the animal sets it more freely to the ground when the pasture is moist and soft. This, however, is only temporary relief; the pain is assuaged, but the disease is aggravated. This fact may easily be ascertained by any one who practically comes into contact with foot-rot. A

lot of sheep affected with the disease appear all very lame on a dry day. Should rain begin to fall, they become apparently a good deal better; but let them be caught and examined, and it will be seen that the disease is progressing; or let a dry day recur, and the lameness returns in a more aggravated form. There are, no doubt, farms so situated, that the growth of grass is most luxuriant in dry seasons, and in some such exceptional cases foot-rot may then prevail to a greater degree.

Foot-rot is generally most prevalent in the months of July, August, September, and October—in fact, it may be said to commence when vegetation arrives at a certain stage, and gradually declines, if properly treated and kept under, as vegetation decays; but if allowed to gain head in a hirsel of sheep, it will prevail throughout the most barren months. No variety of weather will totally eradicate it, and we have seen it to a great extent in November and December, in rich old parks which had been lightly stocked during the summer.

It is not easy to say what breed of sheep is most liable to foot-rot, but it is clear that both Cheviot and Blackfaced, taken from hill-pasture and put in parks in the back end of the year, when the pasture has a tendency to propagate the disease, are far more susceptible to it than park-bred Leicesters on the same pasture and exposed to the same circumstances. We have seen instances of lots of both Cheviot and Blackfaced ewes taken from hill pasture totally free of the disease, and put into grass-parks, and in the course of a month almost every sheep was more or less affected; and although Leicester ewes had been grazing in the same parks all summer, they were not so liable to the disease, nor affected to as great an extent, and were more susceptible of cure. Nevertheless, although Cheviot and Blackfaced sheep are more liable to foot-rot of a certain kind than Leicesters—when it breaks out below the horn or crust—it is clear that Leicester lambs are as liable to the disease as any other breed—that is, when the malady breaks out between the hoofs, and when the skin in the first stage appears a little red and tender, and, as the disease advances, discharges a thick adhesive matter. These facts appear a little contradictory, but we state them from our own personal observation, and cannot venture to give any scientific solution of the two cases. We have, however, never seen lambs affected to any extent with foot-rot on hill-pasture, but in rich old grass parks we have seen whole flocks of lambs seriously deteriorated, especially in wet weather. Conflicting opinions exist among scientific men, stock owners, and shepherds of practical experience and observation, as to the infectious nature of the disease, and there is no doubt the preponderance of evidence is on the side of infection. Judging, however, from our own observa-

tion, we are inclined to believe the contrary, and will state a few facts that have come under our own eye. We have already said there are some rich pastoral farms in Peeblesshire where foot-rot prevails annually, and where hard heathery stock-farms lie contiguous, the sheep always intermixing, and yet a case of foot-rot never occurs on the latter. Again, on a hard heathery stock-farm on which I acted as shepherd for some time, four of the rams got unmanageable during close time, and were shut up in a small enclosure surrounded with a high wall; the ground was soft and potchy, and they all became seriously affected with foot-rot, and a cure could not be effected whilst in that situation. They were turned out to serve the ewes on the hill at Martinmas, very lame, and greatly reduced in condition, but not a single sheep was affected on the hill; and when the rams were taken in, they were quite sound, though no treatment was employed, except that on the day they were turned out to the hill the loose crust was all cut pointedly off, and the diseased parts of the hoof anointed with the butter of antimony. It should be observed that the rams did not catch the disease from infection, as foot-rot was never known to exist on the farm before. The cause was my own mismanagement in confining them in a small, wet, potchy enclosure. On the same farm in a following year the rams got unmanageable in the month of October, and could not be confined from want of proper fences. Pasture was taken for them in an old grass park, the home farm of a gentleman, a few miles distant. In the course of two weeks the whole lot, eight in number, became seriously affected with foot-rot. They were brought home very lame, and turned to serve the ewes at Martinmas. Not a single sheep caught the infection on the hill; and again, the rams, when brought in, were all nearly recovered. I could multiply instances of a similar nature to prove that sheep are not so liable to be infected with foot-rot, at least on what is termed dry hard land, as some writers would lead one to believe. But I think these few facts are sufficient. They also prove that nothing is more essential in effecting a cure than a change to dry hard pasture. It is, however, argued on the other hand by the advocates of infection, that an experiment on hard land, such as described, is not a fair criterion, as sheep are not liable to be affected with foot-rot on such soil; but, on the other hand, we don't know how a trial of the infectiousness of the disease could be made on soft grassy land where foot-rot usually abounds, as it would be difficult to determine whether the disease proceeded from infection or from the natural exciting causes of the pasture and soil. One fact, however, has struck me regarding pasture subject to foot-rot, and it is certainly in favour of non-infection. I have often seen both the fore feet of sheep seriously affected and in the very worst stages of the disease, and the hind feet re-

main quite sound and healthy. Certainly a more favourable experiment could not be devised for infection, with the exception of innoculation with the knife.

Treatment.—It will be observed from the facts already stated, that foot-rot attacks in two different ways—the one being peculiar to old sheep, when the disease breaks out below the crust, and that lambs are more liable to be attacked between the hoofs; and as the treatment we have had recourse to is different, we will relate our own experience and observation with old sheep when the disease breaks out below the crust or horn. The great essential before attempting a cure, is to have a small park to keep the infected sheep separate from the rest of the flock, as it is seldom a cure can be effected with the first dressing, and it is a great annoyance to a flock of sheep to separate the diseased at every application they require. The most dry and hard position on the farm ought to be selected.

Whenever the animal is observed to halt in the slightest degree, it ought to be taken into the park, caught, and examined, and all the loose crust that is separated from the hoof cut off, care being taken not to draw blood. The foot, especially the diseased part, ought to be well cleaned with a coarse cloth; afterwards, the diseased part ought to be anointed with the butter of antimony, and as much put on as the sore absorbs. The animal must be held on its rump for a few minutes till the application takes effect, which is easily known by the proud flesh or ulcers assuming a colour something akin to roasted cheese. After the liquid appears to have done its work and assumes a dry appearance, the animal may be let on to its feet and put into the park. Two days ought to elapse before it is again interfered with, when it should be again examined, even although it may be apparently better, as there is some danger of the disease progressing below the crust, or of the proud flesh not being sufficiently burnt down. If the crust still appears to separate from the hoof, the knife must again be applied, followed by the butter of antimony, and the animal returned to the park, and examined again on the second or third day, and the same treatment had recourse to till a cure is effected, when it may rejoin the rest of the flock. The generality of cases, if caught in the first stage, will yield to the second dressing; but if the disease is allowed to run its course for some time, it may require four or five applications before a cure can be effected. The disease, however, will ultimately yield if treatment is persisted in, except in the case of rams in close time. The grand secret of success in treating foot-rot, as in many other diseases, lies in combating it in the first stage. It is highly reprehensible, besides cruel, to allow the poor animal to go limping about, or sometimes crawling on its knees, for days and even weeks, till the foot is a total mass of

ulcers and proud flesh, and the carcass reduced to such a state of emaciation that it cannot regain condition during the same season. When dressing foot-rot, a dry day ought always to be selected if possible, as the application is likely not to have the same effect when the animal is turned at once to damp, wet pasture. Small quantities of the butter of antimony for present use ought to be kept in a bottle, as the liquid readily loses strength, and in all cases the bottle ought to be closely corked up when not in use. I have seen many applications had recourse to for the cure of foot-rot, and even patronised by persons of practical experience, but I know none equal to butter of antimony when the disease breaks out below the crust. I have had many opportunities of testing this mode of treatment while acting as shepherd in various districts, and, as I have already said, the disease abounds in gentlemen's home farms where the pasture is old and rich. I will relate the following fact, which occurred when I was with Mr Kenneth Scoon, Castleton, Mid-Lothian, who at that time rented the parks on the home farm of Arniston; some of them had lain long in pasture and were very liable to foot-rot. Mr Scoon at that time drafted his Blackfaced old ewes from the pastoral farm of Dewar, in the month of October, and grazed them at Arniston all winter, and sold them in April at House of Muir Market. I entered his service at Martinmas, and found a great many of the ewes affected with foot-rot, and some of them a good deal fallen off in condition. I removed the diseased from the healthy, managed and treated them as already described, and in the course of a few weeks I got the disease nearly subdued; a few fresh cases were always breaking out weekly, but by proper attention and treatment, the disease never spread to any extent, and when the ewes, eight score in number, were sold, only one sheep was slightly affected.

I will next consider the treatment of foot-rot when it breaks out between the hoof, discharging a thick adhesive matter. As we have already said, lambs are most liable to be affected in this manner; sometimes the whole four feet are attacked at the same time. The most successful application I have ever seen is Cuff's foot-rot powder, if the disease is caught in the first stage, and it is highly necessary a dry day should be selected for dressing. As soon as the animal is observed to show lameness, it ought to be caught, and a hard cloth should be drawn between the hoof to clean it well, after which a little of the powder in a dry state should be applied, which can be easily done with the point of a knife. The animal ought always to be held on its rump for a few minutes after the application. The first or second dressing will always effect a cure if the disease is taken in time. If the disease appears to spread through a flock, the whole ought to be examined at once, and not wait till they

all become lame. No time ought to be lost, but the most energetic measures taken, as it spreads with alarming rapidity. Every lamb ought to be examined carefully, and wherever there is the least appearance of matter, or even tenderness, a little of the powder should be applied. A great deal of after trouble will thus be saved, and the flock prevented from losing condition. If the disease is allowed to run its course for some time, and progress below the crust around the heel, the knife must be employed, followed by the butter of antimony, as the powder is slow in effecting a cure after the foot has become all ulcers and proud flesh; but if the disease is caught in the first stage, I have never seen Cuff's powder fail to effect a cure.

Preventive.—It will be seen from the facts already stated, that foot-rot in sheep is a disease difficult to prevent upon certain soils; the only preventive, or, at least, modification of the disease that I have seen had recourse to, is thorough drainage. The effect of this we have seen established on the farm of Harehope, Peeblesshire, which is celebrated as one of the richest in the county. For many years it was but partially drained, and the grass grew unusually rank and soft throughout the summer, and a great part of the sheep pasture was always saturated with moisture. Consequently, in autumn the grasses were usually rotted down and decayed, in a state highly favourable for the propagation of foot-rot, which abounded. The farm changed tenants about twenty-two years ago, and fell into the hands of Mr Tod, Cardrona Mains, who got the stock at valuation at the term of Whitsunday. At that period a great many of the sheep were seriously affected and deteriorated in value from foot-rot, and as the summer advanced and vegetation began to increase, the disease extended its ravages in proportion, till nearly a third of the entire stock, which amounted to above 800, was more or less affected, notwithstanding the most strenuous exertions of the shepherd to subdue the malady. Mr Tod commenced a thorough drainage in summer, and some idea of the rankness and luxuriance of the grasses may be gathered from the fact, that the workmen found the operation utterly impracticable during the summer months, when vegetation was in full growth, and were compelled to stop. They resumed work, and prosecuted it successfully, during the winter and spring, before vegetation commenced. After the foot-rot began to assume a more manageable state, and in the course of a year the disease was totally under subjection. A few cases were always occurring annually, and will occur on such soils under the best precautions; but the shepherd was able to keep the disease from spreading to any extent. The drains were, however, always kept in thorough repair, which is one of the great safeguards on soft grassy land; and if the soil is kept thoroughly drained on hill pasture, and the shepherd has not got too heavy

a charge, it is quite possible to keep sheep, if not entirely free of foot-rot, at least from suffering any serious effects from it. It is highly reprehensible to keep shepherds working at farm labour, as is the custom in a great many districts, neglecting his flock; the blame then rests totally with the farmer. The only preventive being draining the pasture thoroughly, and the strict attention of the shepherd in treating the disease as soon as it can be recognised. Upon rich old grass parks the disease is not so easily prevented. Indeed, upon some gentlemen's parks, where they have lain long in pasture, and where they are not allowed to be ploughed, prevention is almost a matter of impossibility in certain seasons; and there is often no other alternative but strict attention to treatment, and examining every sheep minutely, and paring the loose hoof off before it begins to fester, and anointing with the already mentioned application where there is the slightest symptom of disease. When the foot-rot attacks lambs, breaking out between the hoofs, discharging a thick adhesive matter, I have seen lime act well. A few cartloads were laid down at a gate in the entrance to a park, and the lambs were driven over it twice a-day, which had the effect of hardening the hoof and drying any matter. The lime, however, in a short time gets baked and hard from the constant treading, and requires to be loosened or raked up every now and again; but, as we have already said, lambs are most liable to be attacked in wet weather, and then the safest course is to put them on bare, dry pasture.

Since the above report was written, I have known farmers, owing to the cattle plague, keeping sheep in courts all winter for the purpose of converting their straw into manure, and the attack of foot-rot was very severe, arising from an insufficient supply of litter, for the feet of the sheep will not stand being steeped in urine like cattle. During the winter of 1865-66, Mr Mitchell, Middlestead, put 110 hogs into courts, when in a short time the most of them were suffering severely from foot-rot, which greatly deteriorated them, and from which some continued to suffer till after Whitsunday. Next winter I prevailed upon Mr Mitchell to give the courts another trial, offering to guarantee against foot-rot, if allowed sufficient litter. I put in one-third the number there was the previous winter, and was allowed space in proportion. They were placed in the courts in November, where they remained till April, having what I considered ample litter, and during all that time there was only one slight case of foot-rot, which was cured on the first treatment.

REPORT ON SHIRREFF'S BEARDED WHITE WHEAT.

By Patrick Shirreff, Haddington.

[*Premium—Ten Sovereigns.*]

In reporting "on the means successfully employed for obtaining new and superior varieties or improved sub-varieties of any of the cereal grains," I shall endeavour to comply with the conditions expressed in the Society's Premium Book for 1864, and in the event of not succeeding to do so, a supplementary report will be made on the deficiencies being pointed out.

The subject of this report was picked up in a wheat field in the neighbourhood of Haddington in 1856. Since then it has formed part of a collection selected in the same manner in different parts of Britain, and cultivated yearly up to the present time. This variety has been named "Shirreff's bearded white," and was first sold to the public in 1861. It reproduces itself with constancy from seed, and is unquestionably new in British agriculture. The ear is handsome, the notches being neither wide nor close set. Chaff white with a long beard. Straw of medium length and strength. Grain rather short, white, and transparent, weighing heavier, and perhaps yielding finer flour than any variety cultivated in Scotland. It ripens early, and is suitable for sowing in autumn, winter, and early spring. Since coming into my possession this variety has been grown under similar circumstances, comparatively, with hundreds of varieties, and, so far as I am able to judge, has year after year produced grain inferior to none in the collection.

The beard, which forms one of the characteristics of the plant, is often viewed with dislike, but this appendage is unquestionably advantageous in many situations, and especially so in the damp climate of Scotland; the spring of the beard being so considerable that the ears in the sheaf do not adhere closely, and the consequent free admission of air and sunshine renders the grain fit for thrashing before bald eared wheats can be marketed with propriety.

Believing the raising of new varieties, and testing the productiveness of wheats, to be distinct departments in the progress of improvement, a distinction recognised in the Society's Premium Book, no comparative trial of the productiveness of this wheat has been made by me, but I refer to the following communications from Mr Deans and Messrs Tod, as disinterested evidence of the value of the plant:—

"In 1863 I grew on this farm Hopetoun wheat and Shirreff's bearded white on the same field, and under the same circumstances; both looked well throughout the season, and produced a good crop. Hopetoun had slightly the advantage of bulk of straw, but the bearded wheat yielded the most grain, and was the finest in quality. This season (crop 1864) Shirreff's bearded wheat was the only variety grown on this farm. (Signed) "John Deans."

"Hedderwick Hill, Dunbar,
"26*th October* 1864."

"We carefully tested the lot of Shirreff's bearded white wheat, and were highly satisfied with the results. It yielded as white and well-coloured flour as we ever had from Scotch wheat. The varieties which come nearest to it in these respects are Talavera and Woolly ear.

(Signed) "ALEXANDER AND ROBERT TOD."

"STEAM MILLS, LEITH,
"26*th October* 1864."

This variety of wheat is not a solitary instance of my success in discovering agricultural plants of merit, having in the same way selected, raised, and sent out the Hopetoun and Shirreff oat, The Mungoswells *alias* Fraiser *alias* Lady Hall, Hopetoun, Shirreff's bearded red and Pringle wheat, and the Hopetoun tare—all of them being extensively known in different parts of the world. The history of the Hopetoun tare is somewhat remarkable. The variety has a robust habit of growth, with a pure white blossom, and green seeds of medium size. The plant seemed to have disappeared from British agriculture, and when apparently altogether lost, it formed one of the Norwegian contributions to the Great International Exhibition at London in 1862, and was described in the catalogue thus :—"Of late years the White Flowered or Hopetoun tare (*Vicia sativa flore alba*) has been cultivated at several places. From experiments I have made with this plant, I find it will ripen quite as early, and yield almost double the amount of green food as the common tare."

Properly speaking, selection is the only method by which improved agricultural plants can be obtained, but there are different sources from which a selection may be made.

1*st*, Foreign countries. From an early period of life I have grown wheats from many distant countries without success, unless it were such as had been originally sent from Britain. The foreign wheats generally withstood the rigours of winter, and seemed to thrive up to the time of flowering, when the ears became covered with red powder, and the produce was a few imperfect seeds, and occasionally complete barrenness. In the present year a variety from Australia, named Stone wheat, was covered with red gum (perhaps a fungus) after blossoming, and ultimately a perfect seed could not be found. Amongst this crop there were one or two varieties resembling Talavera, which produced good grain, and in all probability these varieties were originally from Britain. Hitherto I have not observed wheats from foreign countries change by repeated cultivation in East Lothian, and the case of the wheat from Australia is an illustration. Stone wheat underwent no change of habit when growing in East Lothian, and Talavera remained unchanged by having been grown in Australia.

2*d*, Artificial fecundation. My first attempts in this direction were made in the hope of getting early sorts by fecundating Hopetoun with pollen from Fern or April wheat. The resultant

seeds gave rise to inconstant and worthless varieties, and in this instance the breeding plants may have been too distinct in habits. My latter attempts have been more successful, having obtained several good varieties which reproduce themselves with constancy from seed, although they generally prove inconstant. The first plant from a seed formed by artificial fecundation seldom shows much peculiarity, and it is not until the second generation that varieties usually appear. In 1859 I fecundated several florets of Shirreff's bearded white with pollen of an ear from the same root. In 1860 the like operation was repeated on an ear of a resultant plant, and from three seeds so obtained I had in 1861 three plants dissimilar in appearance. One had bearded chaff, one bald chaff, and a third semi-woolly bald chaff —the chaff of all the three being white. The grains of the different plants were dissimilar, one being long and narrow, one oval, and the third round. All had varieties in the second generation, and I have not succeeded in rendering any of the three varieties constant on reproduction from seed, but I soon expect to accomplish this. In 1860 I also fecundated Shirreff's bearded white with pollen from Talavera, and from the resultant plant had high coloured seeds with bearded and bald chaff, from which proceeded in the second year several white seeded varieties, which proved constant on reproduction from seed.

3*d*, Sports, or natural varieties. With all plants, and especially with such as have been long cultivated, varieties appear from time to time. Considering the treatment, extensive growth, and usefulness of our cereals, new varieties are seldom noticed, and too little cared for when observed. It is, perhaps, by means of sports that varieties of wheats have been found adapted to so many climates and situations over the globe, and it is from this source that my selections have been chiefly made. Sports in a growing crop can be obtained and tested without much trouble, and generally prove more satisfactory than varieties from other sources. This may, perhaps, arise from insects and other agencies disturbing the plants' organs of generation, and in this view little distinction can be drawn between artificial fecundation and natural—sporting having from both sources found varieties constant and inconstant on reproduction from seed.

In 1860 an ear was picked up in a crop of Shirreff's bearded white, which from a peculiarity in the chaff I was led to view as having arisen from natural fecundation of one variety with another. Owing to the ravages of wire worm and otherwise, only thirteen plants from the seeds of the ear survived the winter, and out of this crop there were five distinct shades of chaff all different from the chaff of the parent ear. Continuing to grow year by year, up to the present time, small portions of produce descended from the original ear, there are now chaff of all

shades, from white to the darkest red, bearded and bald, woolless and woolly of various densities. The seeds covered by this diversity of chaff are nearly uniform in appearance, and very fine in quality, while the foliage and form of the ears are perhaps identical. A few ears of two kinds of sporting wheat were sent to a friend, who reported results similar to what I had obtained. On a general view of the subject of new varieties of wheat, I regard the cause of sporting a mystery, and the effects a lottery in which the blanks greatly outnumber the prizes.

In early life I was induced to form a collection of foreign wheats sent me by the late John Claudius Loudon, but no variety proved of any value. In 1856 the commencement of my existing selection was formed by personally selecting varieties in the growing crops of different districts. For crop 1857 there were about seventy kinds, including named sorts. Many of the new kinds had been obtained amongst a crop from foreign seed, and all such were laid aside as worthless. In this manner, year by year, new kinds were added to the collection, and others rejected. Crop 1861 contained the greatest number of new kinds on trial, having the seeds of sixty-four ears selected by myself, and also of twenty ears contributed by friends and unknown correspondents, but of this number there were only five or six new and good varieties.

In examining new varieties of wheat, with a view of determining their fitness for propagation, I have experienced difficulty in knowing good from bad quality of grain. Hitherto I have been guided by the appearances which were likely to fetch most money in the market. This is, however, evidently an unsatisfactory measure for new varieties, and it is quite possible that I may have rejected from my collection sorts of the greatest merit. A simple and accurate method of ascertaining the relative value of small samples of wheat is much wanted.

My wheats have been grown contiguous to each other in two rows, eighteen feet in length and one foot apart, with an open space, a yard in width, on all sides to admit of ready access. The plants ought to stand in the rows from two to three inches asunder, to show the tillering, and other peculiarities of the different sorts when growing, noting from time to time the earing, blossoming, ripening, and ultimate height of each variety, and any other peculiarity which may be noticed during the time of growth. Label each kind on being cut down, and place a portion of the crop secure from rain, and when properly dried, preserve small samples. By this means the grain of the whole collection for a series of years can be inspected and compared. The soil on which the wheats are to be grown ought neither to be manurially rich nor poor, open to the free admission of air and sunshine, and if necessary, protected from the ravages of hares and rabbits.

Individuals cannot be expected to accomplish much towards

the improvements of the plants of the farm, the field being so extensive, neglected, and varied, that associations alone can enter upon the task with a hope of success. In following out this course of improvement three departments demand especial attention:—

1*st*, The ascertaining of the best variety for any given locality. This important object can be best effected by comparative trials of different varieties for a series of years, made on such a scale and in such a manner as will command public confidence. When this object has been satisfactorily accomplished, the next step ought to be the obtaining of genuine seeds of the best varieties. This will be easily attained by inspecting the crops growing, and publicly exhibiting the seeds with specimens of the plant. Lastly, rewards ought to be held out for the best new seedlings brought forward at a given time, and in the event of any of them proving equal or superior to the standard kinds the reward to be greatly increased.

Such a course of agricultural plant improving as hath been pointed out may meet with little favour in many quarters, the slowness of the process, the attention required, and the limited remuneration usually attending success in this department, are obstacles to its adoption by individuals, and pressing grounds for associations taking it up.

REPORT ON THE PRUNING OF FOREST TREES.

By John Morrison, Coney Park Nursery, Stirling.

[*Premium—Medium Gold Medal.*]

The improved system of husbandry which has come to be adopted in this country, has tended to raise the physical, moral, and religious condition of the people in an eminent degree. From a state of the utmost rudeness and imperfection, agriculture has become a regular science, and attained an excellence which has compelled it to be acknowledged as a source of national wealth, equal in importance, if not superior, to manufactures or trade.

The greater abundance and moderate price of food resulting from the better cultivation of land, must always be regarded as chief elements in promoting the contentment, happiness, and intelligence of the people; for by being enabled to procure additional comforts, and even many of the luxuries of life, they are encouraged and stimulated to devote attention to the advancement of the arts and sciences, and the diffusion of the blessings of peace, plenty, and religion, over the world.

Great as has been the revolution already effected by such means, the improvements of which husbandry is still susceptible are constantly becoming more apparent. Tracts of hitherto barren country are being gradually brought into cultivation, by means

of draining and planting; fields are sheltered, and facilities afforded for the raising of superior crops, and rearing of cattle; the seats of the wealthy are embellished, the landscape beautified, the local climate changed for the better, and the value of estates very considerably augmented.

Timber being a most necessary and valuable article, not merely as regards domestic comfort and convenience, but likewise in a commercial and national point of view, information respecting the proper management of wood must be considered as of great importance. One of the most effective means to be employed for promoting the healthy condition and increasing the value of plantations, is *pruning;* and on the necessity and advantages of such operations I beg to offer a few remarks.

The chief object of pruning is to prevent the vital energy of the tree being wastefully expended, and to direct it into the proper and natural channels, so that it may become profitable. By the judicious use of the knife nature is materially assisted in her efforts to produce an abundant quantity and good quality of timber, while, at the same time, the permanent health and beauty of the tree are greatly promoted.

The necessity for and advantages of pruning forest trees, may be urged and supported by reference to the beneficial results attending the pruning and training of fruit trees. The attention of the gardener is directed to the best means for promoting the ample supply and excellence of his fruit; but he finds that by allowing a superabundance of branches, he does not always gather a proportionate quantity of produce, for in such cases the sap is drawn forth in the maintenance of superfluous wood and leaves, and the resources of the plant for the production and nourishment of fruit are thereby exhausted. Hence, it becomes necessary to thin out the wood to some extent, and allow the essential property of the tree to flow in a fruit-bearing direction, care being taken, while doing so, to preserve the proper balance of vigour in the subject, by not exceeding the just limit of reduction. In general, a uniform system of pruning fruit trees is followed, and experience testifies alike to the necessity and advantages of the operation.

The aim of the forester, however, is the production of timber, not fruit; but although his object is thus somewhat different from that of the gardener, the seasonable and careful use of the knife will, nevertheless, be found a most effective means of its attainment. There is great force in the old proverb,—

"Just as the twig is bent, the tree 's inclined;"

and the writer has often had occasion to remark its literal truth. In the case of an oak, forty or fifty years old, and which has had no kind hand in the course of that period to check its wild luxuri-

ance, the trunk will be found comparatively slender, only a few feet high, with numerous leaders all striving for the mastery, the entire of its immense head and dwarfish stems being almost valueless either for wood or bark. The sight of such a disproportioned, ill-growing "monarch of the forest," is fitted to call forth regret and pity, rather than admiration; and it may truly be said that it has expended its strength in vain and for nothing. The period of its most vigorous growth, during which it formed the largest circles or zones of wood, is past, and it may fairly be considered to have attained a permanent bent or set, which no subsequent care and attention can alter. But a few well-timed applications of the forester's knife would have kept these leaders in check, and reserved their nourishment for the main stem, which ought to have been preserved free and distinct, and only such branches allowed as were really essential for the full development of the trunk. In such circumstances, a stately, healthy, profitable growth would have been the result, measuring many feet of excellent timber, and yielding a proportionate quantity of superior bark.

The elm, also, if not controlled and directed in its growth, is apt to throw off branches of nearly equal thickness with the main stem. These, if suffered to remain, continue to draw the sap more and more away from the trunk, and prevent its attaining a proper bulk, and so decreasing the value of the wood; they also render the tree top heavy, and interfere with the functions of the roots. They likewise offer a greater resistance to the blast than the strength of the tree is able to overcome, and are liable to be torn and broken by the storm, if indeed they do not cause the tree to be laid prostrate. All such risk and actual damage can be prevented by timely pruning, reducing the plant to proper form, and checking its tendency to produce a redundancy of arms, which the trunk cannot possibly maintain, enabling it to husband its strength for the promotion of its own vigour and to mature its wood more rapidly, and in the shape most likely to be useful and profitable.

If it be true that "the boy is the father of the man," it is no less true that the plant is the father of the tree. It is the tree in miniature, and indicates its disposition at an early stage of its growth. By a cursory examination, we might be able to pronounce what that tendency is, and so regulate, to a certain extent, the amount of knife manipulation required when planting out. It is for want of proper attention being bestowed in the first or early stages of planting operations that so much labour and loss is afterwards entailed, and which might easily be obviated, and a uniform, safe, and simple system of thinning and pruning adopted. The importance of having such a regular system of management established it is impossible to estimate.

But when young plantations have been neglected for some time, and attention is afterwards drawn to the omission, the

trees ought not at once to be thinned and pruned severely, in order to make up for the overlook. The writer has often seen such instances where the plantations were, in one season, deprived of almost every nurse, and the standard trees themselves divested of every branch which could be conveniently reached. The naked and forlorn appearance presented by such sudden and indiscriminate attack on the trees, was melancholy in the extreme, and productive of the most injurious effects. The proper course in all such cases is to prune sparingly, beginning by shredding off a few of the lower scraggy branches, and gradually thinning out and shortening the others, till reduced to one leader, and the tree becomes properly balanced. By such means the vigour of the subject is less interfered with, and it is allowed the best possible chance of rectifying what was wrong in its former state.

But beyond all question, the much better way is to attend to this matter before planting. Every young hardwood tree ought, at the first, to be reduced to one leader, and all straggling laterals shortened. If this be carefully done, little more will be required in the way of pruning for three or four years afterwards, although it might be well to look to the trees occasionally, in case of accidents to leaders, &c. A regular annual examination might then be made with great advantage, for the purpose of thinning outside shoots where necessary, more especially those of a perpendicular tendency, and coming away strong from the bole. All such ought immediately to be cut clean away, the others merely shortened. This would admit a free circulation of air, and give clear head room, while the nourishment supplied by the roots being thus directed more exclusively into the trunk and proper branches, will furnish sufficient matter for adding a healthy and substantial ring of wood every year, as well as producing a luxuriant and beautiful foliage, as essential for maturing the timber, as the roots are for inspiring the tree with life in a generous flow of sap.

If plantations be treated in the manner indicated, the work of the forester will be reduced to a proper method, and ultimately lessened in amount. By the time the trees attain the age of fifteen or twenty years—but not much before that period—he might begin to clear away the lower branches from the trunk. If the shortening process above recommended has been carefully attended to while the trees were young, the increased flow of sap passing up the main stem will have caused the lower branches to become in proportion more stunted; and in their case close pruning may now be adopted with much benefit and little or no risk of injury. The less vigorous appearance of such shoots will point out the necessity for their removal, and also show where the dismemberment should stop. The lopping off of one or perhaps two tiers of such branches in any one season will be sufficient to preserve the trees in the best possible condition;

and after the period above mentioned, they will require little more to be done to them than perhaps an occasional cut with the long-handled chisel, to relieve the top, or shorten an over-vigorous branch, with removing such of the under ones as may from time to time be required.

The mode of management now advocated is infinitely superior to that adopted by some who make the indiscriminate pruning of the side shoots or branches the object of their first attention, and proceed even to the extreme of divesting the tree of such to the extent of two-thirds or three-fourths of its entire height. They thus deprive the plants at once of lungs, clothing, and beauty, and leave only a mere armful of branches on the top. Such treatment is as unnatural as it would be for a shepherd to shear his sheep in the early winter, and leave them to starve during the inclemency of the ensuing season; and it would be as unreasonable to expect a flock to thrive in such circumstances, as to think that a plantation can prosper in the other. Our object in pruning should be to assist nature—not to cripple her in her operations, or deprive her altogether of the means of existence; and the naked, bare-pole appearance of trees subjected to such wholesale deprivation, contrasts most unfavourably with the light, airy, well-feathered, and robust look of those which have been wisely but not too severely thinned.

In the progress of growth plants generally follow certain laws, the operation of which causes them to assume a definite symmetry of appearance. Where these laws are interfered with, the effect is to prevent development to a greater or lesser degree. We find, accordingly, in the case of fruits and flowers which have been unequally exposed to the light and air, that on one side they are frequently less matured and expanded than they are on the other. If, however, a free and full exposure be afforded on all sides, the probabilities are in favour of their being well formed. The same principle will be found to obtain in the case of growing timber. If a preponderance of branches is permitted on one side of a tree, they present a greater exposure to the atmosphere on that side, and so invoke an undue supply of nourishment, to the defrauding and detriment of the other members of the parent stock. The consequence is, that the wood is unequally developed —it is formed more rapidly, and of better quality, on the exposed than on the opposite side; and in this fact we are furnished with an additional argument in favour of pruning, for the sake of preserving the symmetry of the subject, and so permitting it to produce its timber uniformly and with firmness throughout. It need scarcely be added, that a shapely, pyramidal form of tree can be easily given by a little attention.

I may now refer to pointing, an operation which, if judiciously followed along with thinning the branches where occasion re-

quires, is the proper treatment for the majority of hardwood trees. By pointing or shortening the branches, the current of sap is cut off from the branch shortened, and diverted into the trunk, while, at the same time, the number of laterals and amount of foliage are increased, and both combined are the balancing power of the tree. The principal guide in pointing is to keep the symmetrical appearance of the plant in view, and allow the branches to be developed as much as possible in regular order, so that they may distribute the life fluid to all its parts in just proportion. It must be borne in mind that we are pruning for quality as well as bulk of timber; for if by such means we increase the growth beyond nature, we may add to the quantity at the expense of the quality of the wood. But where a tree is well stocked with proper branches and an abundance of leaves, the formation and maturing of the wood will be carried on equally. To gain this important end, then, it is necessary to perform the operation of pointing when the plants are young, and within the compass of handling with the pocket-knife. Wherever a straggling branch appears, or one competing with the leader, it should be pointed at once, and its direct communication with the main stem and leader broken. If the cut is made close beside a lateral on the branch, fewer branches will spring; but if a few inches beyond, fresh eyes will make their appearance, and assist in covering the tree with additional foliage. When growing timber is thus treated, the lower shoots after a time begin to lose their wonted vigour (unless when planted in the open park or lawn, where the trees have a greater amount of air, in which case they make splendid specimens); and, as already mentioned, after standing for fifteen or twenty years, such branches may be gradually taken off. By that time we may conclude the trees have arrived at maturity, when they require less attention.

In close pruning it is of consequence that a clean cut be made, and close to, but so as not to interfere with, the main stem or bole. When neatly performed, the process of healing over is more rapid, and there is less risk of an unsightly scar being left, than when the work is done clumsily and by making a ragged wound. If the directions above given be strictly followed, there can be no large branches to cut off; and when the clearing of the stem of the lower shoots is proceeded with, if done with the most ordinary care, no check or injury can be given to the tree, or blemish left by their amputation.

The season most suitable for pruning is the early spring months, although we ought to be guided more by the weather than by any definitely fixed period of time. In general, however, the heavy end of the frost is over by the month of January, and in such seasons the work may be commenced, when about six weeks may be relied on as safe for continuing it. I am averse

to its being proceeded with sooner, in case of severe frost afterwards setting in, which I have always found to be highly injurious to such of the trees as have fresh wounds on them. Autumn pruning is not to be recommended, for the reason that the plantations are then going into a state of rest for the winter, and perfecting their wood of the past season. It is, therefore, much to their advantage if they are let alone at this time. But in midsummer a good deal of light pruning may be done, such as pointing and relieving the tops, and balancing the trees, and cuts heal readily at this period of the year. But no heavy pruning ought on any account to be attempted at this season.

Where time permits, young plantations ought to be looked over in the course of the summer, and their condition regulated. The great fault of all our pruning hitherto has been in allowing the trees to be too old before commencing such operations; and were we to combine close pruning with pointing in all cases where both are required, the latter will always fully make up for any loss the plants may sustain by the former. Simple as this mode of treatment may appear, it will be found, on being adopted, to aid materially nature's exertions in carrying on and perfecting her work.

The following hardwoods are specially adapted for the management now recommended; while each sort will be found to thrive best under the particular treatment of pointing, close pruning, &c., given with the accompanying list :—

The Ash (*Fraxinus excelsior*).—Pointing and close pruning. This variety is very apt to get into large heads, unless kept under by pointing, and the leader allowed clear head room. Also requires thinning occasionally.

The Beech (*Fagus sylvatica*). — Principally thinning the branches by close pruning, and all stragglers shortened.

Spanish Chestnut (*Castanea vesca*).—Pointing and close pruning. Liable to run away with strong side shoots if not looked after in time by pointing.

The Elm (*Ulmus montana*).—Pointing principally, with an occasional branch cut clean off where too thick.

The Lime (*Tilia europœa*).—Pointing; makes most beautiful specimens by such treatment, few or none of the branches requiring to be cut clean off for a time. As the tree advances, thinning becomes necessary.

The Oak (*Quercus Robur*).—Pointing and close pruning. Requires to be often looked over, every season at least. Young trees in a healthy state make rapid growths in a season, and soon run wild if not attended to by pointing.

The Turkey Oak (*Quercus Cerris*).—The same treatment as the British oak. Principally pointing when the shoots are young. This variety is a very rapid grower, and has a tendency to straggle.

The Scarlet Oak (*Quercus coccinea*).—Stands the knife well, and should be treated similar to the British oak.

The Abele Poplar (*Populus alba*).—Principally pointing; being of rather a straggling habit, does well with free exercise of the knife.

The Black Italian Poplar (*Populus acladesca*).—Pointing; a rapid grower, and requires constant attention when young.

The Ontario Poplar (*Populus macrophylla*).—Pointing and close pruning; a robust grower, and should have partial thinning.

The Willow (*Salix* var.).—This tribe should be looked over annually for some time after planting, when the branches which require it should be pointed. Being of free growth, is apt to throw out strong shoots, which soon swell into powerful limbs, and these detract from the girth, and are liable to be torn from the tree with every high wind. This may easily be remedied by a little extra attention when the trees are young.

The Birch (*Betula alba*).—Pointing, with an occasional branch cut close. Under this treatment forms a most beautiful tree, but should be done early in spring, as with late pruning it is apt to bleed much. Does well with summer pruning.

The Sycamore or Plane-tree (*Acer Pseudo-Platanus*).—Pointing chiefly. This, and indeed all the Acer tribe, ought to be pruned very early in the season, as otherwise they have a tendency to bleed. In midsummer I have often pruned to advantage.

From what has been stated, it will be seen that I am no advocate for the system of extreme pruning sometimes followed, nor do I approve of plantations being left entirely to themselves—a plan frequently recommended with much plausibility, but found in practice to be far from proper. Growing timber, if well cared for when young, even although at some additional outlay, will ultimately pay, while that carelessly treated never will; and trees which are properly managed will always present a much more pleasing appearance than those which are grudgingly attended to.

So seldom is it necessary to prune trees of the Coniferæ or Pine tribe, that one is almost afraid to approach this part of the subject, more especially as the whole family are worthy objects of admiration; and when allowed to stand unmolested, form in most cases perfect pyramids from the green sward upwards. It is important, however, to know whether it be really advantageous to apply the knife to the coniferæ, and also when and to what extent; and in order to assist us in the settlement of the question, let us examine the subject carefully. With the view of simplifying the inquiry, we shall divide the tribe into families, and consider the treatment proper for each.

1. The Pines proper, of which the Scotch fir (*Pinus sylvestris*) is the type. Little can be done in the way of assisting these

beyond shortening a wild side shoot or double leader. Being less free in pushing fresh shoots than the generality of hard-woods, it must be borne in mind that when a branch is removed from a pine, the gap thereby made is less likely to fill up, and hence some consideration is necessarry before operating. But this caution applies more particularly to specimens, as in ordinary plantations the regularity of the branches is not so much observed. In plantations of Scotch fir, when the lower branches lose their vigour, and their growth is at a stand-still, as compared with those higher up on the tree, they can be close pruned with much advantage and perfect safety. Where the timber is planted moderately thick, the lower shoots will be kept in check, and led to decay; and, when being removed, much caution has to be exercised, in case of hurting the stem, as the blood-vessels of the pines being larger than those of other trees, and not so easily healed, improper wounds may continue to run for years, and ultimately kill the tree. In all resinous-producing trees the drawing of blood should as much as possible be avoided. The above remarks apply to the whole of this family.

2. The next division of coniferæ is the *Abies,* or Spruce fir, of which the Norway Spruce may be taken as the type. This class will bear pruning more or less, and some of them with advantage. But this variety never shows with finer effect than when allowed to grow naturally, attention being only given to the checking of over-growths and double leaders. Where they are permitted free space to expand their branches properly, there is perhaps not a more attractive tree for the outline of the lawn or pleasure ground. The *Abies americana nigra,* or Black Spruce, or *Abies americana alba* and *rubra,* all require similar treatment to the Norway Spruce, unless grown somewhat thick, which will cause the branches to decay, and these should at once be cleared away. The Douglas Pine, or *Abies Douglasii* variety, is less liable to be injured by pruning, indeed it is often necessary to use the knife pretty freely to this sort. When young, they frequently throw up double tops; also, the side shoots often come away very strong and form themselves into leaders, so that unless checked at this stage they take more the habit of bushes than trees. But they are easily kept under, and stand the knife well when applied to the young branches; are of very free growth, and when they attain about six feet in height there is less fear of the side shoots overtaking the leader. Perhaps this is the finest of all the Abies tribe. They make magnificent specimens, and are rapid growers. The timber is said to be excellent; and were it more within bounds in price, this, in my humble opinion, is the only real substitute for the larch. If looked after, which I hope it may come to be, it is likely to play a prominent part in the commercial world at no very distant period.

3. The *Picea* is the next in order, of which the common Silver fir (*Picea pectinata*) is the type. Forms fine specimens, but generally requires no pruning. *Picea nobilis* bears shortening of the young branches very well, and often requires to be operated on. This variety is apt to throw out strong branches, and thereby dwarfs the top shoot, and a little thinning and shortening is necessary, to cause a freer growth in the leader. *Picea Nordmanniana* may be treated in a similar manner to *Nobilis*, but needs it to a somewhat less extent. Where the branches come thick on each other, and strong, they should be thinned and shortened, to let the top away freely. *P. grandis* is occasionally of a straggling habit, when a little shortening is demanded, but no thinning. *P. cephalonica* will bear pruning less, and generally requires little to be done to it. *P. Pinsapo* cannot be approached with the knife without spoiling its beautiful proportions. When well grown, this is perhaps the finest formed tree in the whole pine tribe, and ought to be in every collection. The Larch (*Larix europæa*) is probably the most generally useful of all our timber trees, and at the same time the most roughly handled of any. Being of rapid growth, it is very serviceable as a nurse, and often employed for that purpose ; and the harsh treatment it meets with while so used has often proclaimed to us how unwise it is to touch a living branch. Let a plantation where these trees are grown as nurses be examined, and see where the forester, in relieving some favourite hardwood, has brought his hedgebill down the broadside of a larch, to make room for the more permanent tree. If the bill has unfortunately pierced the bark of the larch, it is more than likely it will retain the mark, exuding resinous matter for years, perhaps till canker set in and death follow. May it not be the case that such treatment has been a cause of the present disease? The Cedar (*Cedrus Deodara*) stands pruning well in its young branches, and when up a little, requires nothing further to be done to it.

I beg to conclude with expressing the hope, that the observations above made will be found useful to those less acquainted with the subject practically, and shall be glad if what has been stated may be the means of leading to a better system of management of forests, and especially to the adoption of a uniform method of treatment by pruning.

REPORTS ON DIFFERENT DESCRIPTIONS OF FOOD FOR STOCK.

By Robert J. Thomson, Grange, Kilmarnock.

[*Premium—Twenty Sovereigns.*]

I. *Some Experiments on the comparative Feeding Values of Swedes and Mangold Wurzels,* 1864.

Liebig's famous classification of food into nitrogenous and non-nitrogenous, or rather, we should perhaps say, into plastic or flesh-forming, and respiratory or heat-supporting, must ever be regarded as having marked an important epoch in the history of the chemistry of food. It opened a broad pathway through a tangled forest, and afforded to all followers numerous new stand-points from which to view the intricacies of animal nutrition. Men of science in all parts of the world, attracted by so brilliant an hypothesis, almost at once became the disciples of the illustrious German. The most distinguished chemists of the age immediately set about ascertaining, by laborious research, the composition of almost every edible, tabulating their values in the scale of nutrition by ranging them in the order of their per-centages of nitrogen ; and physiologists, learned and unlearned, set themselves, with unwonted assiduity, to examine and to criticise the merits and demerits of this famous classification.

Several years have now passed away, and the inexorable test of practical experience has put it to the proof; but, alas ! the result is that the percentage of nitrogen gives, at the best, but an approximate idea of the nutritive value of different kinds of food, and not unfrequently altogether misleads. No one believes, for example, that bran is as nutritious as flour, or that rape-cake is equally valuable with linseed-cake, yet their percentages of nitrogen are practically identical. We believe, notwithstanding the able critiques of certain physiologists, that Liebig's hypothesis, looked at in the most liberal light, is, in the abstract, theoretically correct, but that it fails in ordinary practice, simply because circumstances and conditions modify or invalidate the deductions from chemical analyses as ordinarily made. We all know that the corrosive action of a strong acid is entirely neutralised when in combination with an alkali, which combination possesses properties entirely different, not only from the acid itself, but also from all other combinations of the same acid with other alkalies. And so it is with nitrogen in the much more complicated and exceedingly intricate organic compounds which form the food of animals—compounds, many of which chemistry has not yet even pointed out with distinctness, and regarding the properties of which nothing is positively known. It is a remark-

able fact, that many of our most deadly poisons differ but little in composition from well-known substances which are confessedly highly nutritious.

In estimating theoretically the comparative nutritive values of different kinds of food, physiology as well as chemistry must do its part. The chemist must not only make known to us the elementary composition of the foods, but he must also show the states of combination in which they exist; and the physiologist must not only tell us the states of combination in which these elements are most readily assimilated, but he must also show the proportions of one to another required for the formation of bone, muscle, fat, and milk, respectively. This accomplished, it would become as easy a calculation to show the quantity of a given food required to produce a certain amount of bone, muscle, fat, or milk, as it now is to show the quantity of a given coal required as food to the iron horse to produce a certain amount of work. It is almost superfluous, however, to remind the reader how very far indeed either chemistry or physiology is from having reached this acme of perfection, or to state that the method of investigating the comparative nutritive values of different kinds of food, on which most reliance can in the meantime be placed, is unquestionably practical experiments. It should not be forgotten, however, that experiments on the feeding of animals are peculiarly liable to inaccuracies, from the ease with which animal functions are disordered, and the difficulty of discovering the presence of minor disorders. All animals will, at times, eat more or less heartily than usual. A milch cow will suddenly give a pound or two more or less milk than usual for a day or two without any apparent cause, and a fattening beast will sometimes actually lose weight, or at least will gain nothing, when feeding as well as usual, and apparently in full health. It is exceedingly difficult, too, if not impossible, to get a sufficient number of animals whose constitutions are exactly alike: some assimilate a much larger proportion of their food than others, and occasionally the same food is found to produce different effects on different animals, so that all such experiments, before we are warranted in arriving at any definite conclusions, must be repeated many times.

On January 16th 1864, four milch cows, four feeding beasts, four queys (heifers) rising two years old, and four stirks rising one year old, all of the Ayrshire breed, were put up in pairs and fed alike till February 3d, particular notice being taken of the quantity of food which each lot of two could consume per day. The quantities at last fixed upon for each lot, and the hours at which they were given during the whole time the experiment lasted, will be found in Table I.

Table I.

Milch Cows and Feeding Beasts.

5 A.M.—37⅓ lbs. roots, 2 lbs. hay chaff, and 4 oz. salt, steamed, and 2⅔ lbs. beanmeal added.
5·30 A.M.—4 lbs. hay.
6 A.M.—Milch cows milked; milk weighed.
9·30 A.M.—4 lbs. hay, water *ad lib.*
11 A.M.—Steamed mess, as at 5 A.M.
11·30 A.M.—4 lbs. hay.
5 P.M.—Steamed mess, as at 5 A.M.
5·30 P.M.—4 lbs. hay.
6 P.M.—Milch cows milked; milk weighed.
7 P.M.—28 lbs. roots, raw.
8 P.M.—4 lbs. hay, water *ad lib.*
Daily quantity for each animal.—56 lbs. roots steamed, and 14 lbs. roots raw = 70 lbs. roots; 3 lbs. hay chaff steamed, and 10 lbs. hay = 13 lbs. hay; 6 oz. salt, 4 lbs. beanmeal.

Queys.

5 A.M.—42 lbs. roots, 3 lbs. hay chaff, and 3 oz. salt, steamed.
9·30 A.M.—4 lbs. oat straw, water *ad lib.*
11·30 A.M.—4 lbs. oat straw.
5 P.M.—Steamed mess, as at 5 A.M.
8 P.M.—4 lbs. oat straw; water *ad lib.*
Total for each animal.—42 lbs. roots, 3 lbs. hay steamed, 6 lbs. oat straw, and 3 oz. salt.

Stirks.

5 A.M.—18⅔ lbs. roots, 1 lb. hay chaff, and 1 oz. salt, steamed.
9·30. A.M.—4 lbs. oat straw.
11·30 A.M.—Steamed mess, as at 5 A.M.
5 P.M.—Steamed mess, as at 5 A.M.
8 P.M.—4 lbs. oat straw.
Daily quantity for each animal.—28 lbs. roots, 1½ lbs. hay, steamed; 4 lbs. oat straw, 1½ oz. salt. Water always before them.

TABLE II.—Milch Cows.

Lots.	Weight in lbs. on Feb. 3.	Weight in lbs. on Feb. 17.	How Fed and Gain.	Loss.	Weight in lbs. on Mar. 2.	How Fed and Gain.	Loss.	Weight in lbs. on Mar. 16.	How Fed and Gain.	Loss.	Weight in lbs. on Mar. 30.	How Fed and Gain.	Loss.	Total. Gain.	Loss.	When Feeding on Swedes. Gain.	Loss.	When Feeding on Mangolds. Gain.	Loss.	Summed Totals when Feeding on Swedes. Gain—loss=gain.			Mangolds. Gain—loss=gain.			Result.
1 a	982	941	Swedes ...	41	938	Mangolds ...	3	986	Swedes 48	...	967	Mangolds ...	18	...	15	48	41	...	21							3 cows did best on Swedes. 1 cow did best on Mangolds. 40 — 18 = 22 lbs. in favour of *Swedes*.
1 b	809	778	...	31	809	31	...	787	...	22	826	39	...	17	...	...	53	70	...							
2 a	926	931	Mangolds 5	...	957	Swedes 26	...	960	Mangolds 3	...	978	Swedes 18	...	52	...	44	...	8	...	134	94	40	78	60	18	
2 b	976	951	...	25	967	16	...	953	...	14	979	26	...	3	...	42	...	...	39							
Feeding Beasts.																										
1 a	869	896	Swedes 27	...	910	Mangolds 14	...	940	Swedes 30	...	964	Mangolds 24	...	96	...	57	...	38	...							3 beasts did best on Swedes; 1 beast did equally well on both. 193—156=37 lbs. in favour of *Swedes*.
1 b	862	892	30	...	912	20	...	936	24	...	963	27	...	191	...	54	...	47	...							
2 a	837	860	Mangolds 23	...	873	Swedes 13	...	885	Mangolds 12	...	907	Swedes 22	...	70	...	35	...	35	...	193	...	193	156	...	156	
2 b	905	922	17	...	945	23	...	964	19	...	988	24	...	83	...	47	...	36	...							
Queys.																										
1 a	539	539	Swedes ...	...	550	Mangolds 11	...	560	Swedes 10	...	579	Mangolds 19	...	40	...	10	...	30	...							2 queys did best on Swedes; 2 queys did best on Mangolds. 92 — 62 = 30 lbs. in favour of *Swedes*.
1 b	540	554	14	...	567	13	...	587	20	...	588	1	...	48	...	34	...	14	...							
2 a	568	586	Mangolds 18	...	592	Swedes 6	...	602	Mangolds 10	...	614	Swedes 12	...	46	...	18	...	28	...	92	...	92	76	14	62	
2 b	512	498	...	14	521	23	...	525	4	...	532	17	...	30	...	30	...	4	14							
Stirks.																										
1 a	370	379	Swedes 9	...	371	Mangolds ...	8	381	Swedes 10	...	388	Mangolds 7	...	28	...	19	...	7	8							3 stirks did best on Swedes; 1 stirk did best on Mangolds. 51 — 42 = 9 lbs. in favour of *Swedes*.
1 b	324	323	...	1	345	22	...	338	...	7	349	11	...	25	...	...	8	33	...							
2 a	343	347	Mangolds 4	...	359	Swedes 12	...	358	Mangolds ...	1	372	Swedes 14	...	29	...	26	...	4	1	59	8	51	55	13	42	
2 b	352	348	...	4	356	8	...	367	11	...	373	6	...	21	...	14	...	11	4							

TABLE III.—WEIGHT OF THE MILK.

Lot.	Feb. 18. How fed.	Mar. 3. How fed.	Less on	Mar. 17. How fed.	Less on	Mar. 31. How fed.	Less on	Total Less.	Average. Less.	
	lbs. oz. Swedes.	lbs. oz. Mangolds.	lbs. oz. Mangolds.	lbs. oz. Swedes.	lbs. oz. Swedes.	lbs. oz. Mangolds.	lbs. oz. Mangolds.	lbs. oz.	lbs. oz.	
1 *a*	444 13	413 5	31 8	390 5	23 0	348 2	42 3	96 11	32 4	
1 *b*	335 11	335 10	0 1	318 9	17 1	302 0	16 9	33 11	11 4	
	Mangolds.	Swedes.	Swedes.	Mangolds.	Mangolds.	Swedes.	Swedes.			
2 *a*	243 8	239 10	3 14	196 14	42 12	185 7	11 7	58 1	19 6	
2 *b*	425 0	410 3	14 13	365 2	45 1	335 13	29 5	89 3	29 12	

Lot.	Total When Feeding on		Corrected Total * Showing Individual Effects in Favour of				Total. (Collective.)		Result.
	Swedes.	Mangolds.	Swedes.	Mangolds.	Swedes.	Mangolds.	Swedes.	Mangolds.	
	lbs. oz.	lbs. oz.	lbs. oz.	lbs. oz.	lbs. oz.	lbs. oz.	lbs. oz.	lbs. oz.	
1 *a*	835 2	761 7	835 2	793 11	41 7	... ...	2660 7	2629 9	= 30 lbs. 14 oz. in favour of *Swedes*.
1 *b*	654 4	637 10	654 4	648 14	5 6	... ...	... ...	... ...	
2 *a*	425 1	440 6	444 7	440 6	4 1	... ...	... ...	... ...	3 gave most on Swedes.
2 *b*	746 0	790 2	775 12	790 2	... ...	14 6	... ...	... ...	1 gave most on Mangolds.

* Made by adding the average natural loss of one fortnight to the amount given when on Mangolds in the case of Lots 1; and when on Swedes, in the case of Lots 2.

PERCENTAGE OF CREAM.

LOT.	FEB. 15.			FEB. 29.			MARCH 14.			MARCH 28.			TOTAL.		TOTAL.		RESULT.
	Morn.	Even.	Aver.	Morn.	Even.	Aver.	Morn.	Even.	Aver.	Morn.	Even.	Aver.	Swedes.	Mangolds.	Swedes.	Mangolds.	
1 *a*	15	15	15·0	14	14	14·0	14	15	14·5	14	15	14·5	14·75	14·25	13·62	13·81	= ·19 per cent. in favour of *Mangolds.*
1 *b*	15	14	14·5	16	15	15·5	15	15	15·0	15	14	14·5	14·75	15·00	...	...	
2 *a*	13	13	13·0	12	12	12·0	13	12	12·5	12	13	12·5	12·25	12·75	...	...	3 in favour of Mangolds.
2 *b*	14	13	13·5	13	13	13·0	13	13	13·0	13	12	12·5	12·75	13·25	...	...	1 in favour of Swedes.

OUNCES BUTTER FROM 10 LBS. WHOLE MILK.

LOT.	FEB. 15.			FEB. 29.			MARCH 14.			MARCH 28.			TOTAL.		TOTAL.		RESULT.
	Oz.	Drs.	How fed.	Oz.	Drs.	How fed.	Oz.	Drs.	How fed.	Oz.	Drs.	How fed.	Swedes	Mangolds	Swedes	Mangolds	
													oz. drs.	oz. drs.	oz. drs.	oz. drs.	
1 *a*	2	7	S	3	6	M	4	8	S	3	5	M	6 15	6 11	...	...	= 2 oz. 5 drs. in favour of *Mangolds.*
1 *b*	2	1	,,	3	13	,,	3	13	,,	4	4	,,	5 14	8 1	26 1	28 6	2 best from Mangolds.
2 *a*	3	2	M	2	9	S	2	15	M	3	8	S	6 1	6 1	...	...	1 best from Swedes.
2 *b*	4	8	,,	3	2	,,	3	1	,,	4	1	,,	7 3	7 9	...	...	1 equally well on both.

QUALITY OF BUTTER.

LOT.	FEB. 15.		FEB. 29.		MARCH 14.		MARCH 28.		TOTAL.		TOTAL.		RESULT.
									Swedes	Mangolds	Swedes	Mangolds	
1 *a*	3d	S	1st	M	2d	S	1st	M	5	2	...	...	= 6 in favour of *Mangolds.*
1 *b*	4th	,,	3d	,,	1st	,,	2d	,,	5	5	23	17	2 best from Mangolds.
2 *a*	2d	M	2d	S	4th	M	3d	S	5	6	..	...	1 best from Swedes.
2 *b*	1st	,,	4th	,,	3d	,,	4th	,,	8	4	...	...	1 equally good on both.

An attempt was made with sheep likewise. Eight Cheviots, in order to have a duplicate experiment, were put up in the same way in pairs, and at the same date; but from their having been unused to confinement they made but little progress, and the experiment with them was a failure. No notice is therefore taken of them hereafter.

The milch cows had all calved in the last fortnight of December 1863, and were as nearly alike in size, age, and condition as we had. The feeding beasts were chosen from a number of others which had fed together for at least two months. The queys and stirks had fed together all their lives. The milch cows, feeding beasts, and queys were fed in stalls, and the stirks in loose boxes. It was thought better to give a fair proportion of beanmeal and fodder along with the roots, than merely roots alone, simply because, in the best practice, this is always done; and our object was to get the comparative values of swedes and mangolds—not so much *per se*, as under the conditions in which they are used in ordinary practice. The roots and hay chaff were steamed in eight separate boilers (one for each lot), put up expressly for experimental purposes. These were filled and steamed twice a-day. The roots were weighed as they were put in, on a machine standing close to the boiler, and the hay chaff and salt were measured in the dishes used for carrying them. A "cooler" was provided for each lot, in which the food was put direct from the boilers, and in which it was mixed, divided, and carried to the cattle troughs. The beanmeal was weighed once a-day, and was put into old milk dishes, which were set in the feeding passage opposite to their respective lots. The hay and straw used were put up into "bottles" weighed to 4 lbs. each, a week's supply being put up at a time. The byre was very suitable for the purpose, there being a passage both behind and before the cows. The weight of the milk was taken as drawn from the cows, morning and evening, by means of a 30 lb. Salter's spring-balance, adjusted to stand at zero with the empty "luggie" on. It was set in a convenient place at the entrance to the milk-house, and beside it, on a window sill, lay the milk-book and pencil.

On February 3d all the animals were weighed. All the lots 1 were then put on the swede diet, and all the lots 2 on the mangolds. On February 17th they were again weighed. The lots 1 were now put on mangolds, and the lots 2 on swedes, and so on, at March 2d, March 16th, and March 30th, when the experiment was concluded. These weighings will be found in Table II.

On the second last day of each fortnight the milk given was taken to represent the produce from swedes and mangolds respectively One sample from each milking on that day was put into a long glass hydrometer jar, graduated into 100 parts, in order to ascertain the percentage of cream, which was read off after standing

24 hours. Another sample was used in taking the specific gravity of the whole milk. This was done at first by the lactometer, but latterly, as being more correct, by the bottle. About 2000 grains were acidulated with a few drops of hydrochloric acid and heated to about 170°, when the casein immediately coagulated. The whey was filtered through unbleached cotton, cooled down to 60°, and its specific gravity taken. After the percentage of cream was read off a sample of the skimmed milk was drawn from the jars by means of a siphon, and its specific gravity taken likewise. The object of taking these specific densities was to ascertain the relative quantities of casein and oily matter, or, in other words, cheese and butter, which the milk from the different foods was capable of yielding. We know that the oily matter in whole milk rises to the surface as cream, because it is lighter than the other ingredients—the skimmed milk. The greater the difference in density, therefore, of the whole milk and the skimmed, the greater the quantity of butter; and, in like manner, because casein (curd) is heavier than the other ingredients—the whey—the greater the difference in density of the whole milk and the whey, the greater the quantity of cheese. We think the relative quantities of butter and cheese which different milks contain may be more correctly estimated by these methods, if carefully done, than by means of the churn and the cheese tub. In the course of some experiments made subsequently to these, we discovered accidentally that the density varies to a considerable amount, comparatively speaking, with the age; and as no particular attention was paid to have them always taken at exactly the same time, the results, although carefully and laboriously made, must be thrown aside. We mention this cause of failure for those who may undertake similar experiments. 10 lbs. of the whole milk from each cow, morning and evening mixed, were put past for two or three days in small numbered "crocks," and were thereafter churned. The first churnings (from milk given on February 15th) were done in a small common upright churn. Nos. 1 *a* and 1 *b* were done at the usual temperature for churning cream, which, however, was found to be much too low, as No. 1 *a* took 2 hours and 40 minutes, and No. 1 *b* 3 hours and 10 minutes. The quantity was less than it should have been, and the quality was quite inferior. Nos. 2 *a* and 2 *b* were churned at 66°, which, being successful, was the temperature always employed thereafter. All the other churnings were done in a small *double* churn which we got made for the purpose, by Messrs Jack and Son, Maybole, price £2, 5s. One of the milks from the swedes was always churned with one from the mangolds; it was observed that the latter usually took fully longer time. But the most remarkable thing was the colour of the butter, which was invariably very white from the mangolds, while the butter from

the swedes had always a fair yellow colour, which gave it a much richer appearance. This richer look, however, was no guarantee of quality when smelt or tasted; for the mangold butter was usually the sweeter of the two, and would, we believe, have brought a higher price in the market than the Swede butter had it been artificially coloured. Samples of the butter were regularly judged by a gentleman whose services as a butter judge are in frequent requisition at the dairy produce competitions in this county, the result of whose judgment we give in a tabulated form in Table III., where will also be found the weights of the milk, the percentages of cream, and the quantities of butter from 10 lbs. of whole milk.

II. *Some Experiments on the Comparative Feeding Values of Swedes and Mangolds,* 1865.

The experiments on the comparative feeding values of swedes and mangolds, which we made in the spring of 1864, resulted, contrary to our expectation, somewhat in favour of swedes; we therefore resolved to repeat them at the first opportunity. Now, the only season of the year in which experiments on the comparative feeding values of swedes and mangolds can be made is from January to March inclusive; for before January mangolds are not ripe, and cause animals fed on them to scour, and after March swedes deteriorate very rapidly. It may be said, indeed, that even in these very months swedes are gradually losing in quality, while mangolds are gradually improving. Our next experiment was made in 1865, beginning on January 4th, and ending on March 29th. Several important differences were made in the plan of carrying out this experiment from the former one, which it may be well to mention before proceeding to give the results. We thought proper to confine the 1865 experiment entirely to milch cows, not only because such an experiment is more interesting, but also because it is more important. The often-referred-to statistics, collected by the Highland Society ten years ago, show that the cultivation of the mangold in Scotland is chiefly confined to the dairy districts; and in these districts it will be found that the mangold crop is generally almost exclusively reserved for the milch stock. A duplicate experiment was made by taking eight cows, and dividing them into lots of two each as before. As considerable difference of opinion exists regarding the time in which a change of food affects the animal, we lengthened the periods from 14 to 28 days each, and took account of the milk given only during the last 21 days of each period. We had to relinquish taking the specific gravities altogether, as our time was pretty well taken up otherwise. The

quantity of butter was taken from 2 lbs. of cream, instead of from 10 lbs. whole milk, as formerly, because we have always got less variation from churning cream than from whole milk. The milk given on the second last day of each period was put up, each lot by itself, and 2 lbs. of pure cream taken for trial in the churn. The difficulties previously experienced in taking notes of the colour of the milk and butter, or of remembering them from one period to another, with anything like exactness, were got over by the construction of colour measures, which we have dubbed "Lactoscope" and "Butterscope" respectively. They consist of tin plates, 15 inches long and 3 inches broad, and are divided into ten equal parts, which form an ascending scale, on the same principle as the ozonometer, from which, indeed, we took the idea. They are painted in oil colours—No. 1 on the butterscope is pure white; the others shade gradually to No. 10, which is a deep rich yellow, copied from a sample of Irish butter. The lactoscope was painted from samples of milk prepared for the purpose by mixture with water or cream, as the case might be. No. 5 is a good white, ordinary milk colour, and shades to No. 1 with a blue tint, and to No. 10, with a light cream. With both, therefore, the higher the number given the richer is the colour.

The kind and quantities of food given were the same as in the former experiment,* with exception of the fodder, which during the first period, January 4th till February 1st, was oat straw; from February 1st till March 1st, it was bean straw, cut into chaff; and from March 1st till March 29th it was a mixture of oat straw and bean straw (about half and half), also cut into chaff. The animals were so fond of this mixed chaff, and ate it with such relish, that we allowed 1 lb. additional to each lot at every meal, from the 6th of March. This formed an interesting experiment of itself; for on examining the tables it will be found that, taking the animals as a whole, they gained much in weight when on the bean straw alone, but, notwithstanding, gave considerably less milk (which seems to indicate a high fattening value for bean straw), and that when fed on the mixture, they not only still continued to gain weight, but gave more milk, taking everything into account, than either when on oat straw alone or on bean straw alone (which shows the importance of a mixture of food). The rest of the results given were obtained in the same manner as in the former experiment.

Lots 1 and 2 calved in September 1864, and lots 3 and 4 early in December. All had been together, and fed alike for a considerable time. On January 4th, 1865, all the animals were weighed, and lots 1 and 3 put on the swede diet, and lots 2 and 4 on the mangolds. On February 1st they were again weighed,

* See Table I. p. 54.

and the diet changed; lots 1 and 3 being put on mangolds, and lots 2 and 4 on swedes. The same thing was gone through on March 1st; and at March 29th, when the experiment was concluded, the animals were again weighed. These weighings will be found in Table IV.

The weight of the milk given during the last twenty-one days of each period is given in Table V., and all the observations on the quality of the produce will be found in Table IV.

In the experiments of both years the results have been somewhat in favour of swedes, so far as regards the increase of live weight, and, though to a smaller extent, the quantity of milk given; and in favour of mangolds, so far as the quality of dairy produce (colour excepted) is concerned. We can scarcely infer, however, that in every case these results will follow; for the feeding value of every species of plants is considerably modified by the circumstances, whether as regards climate or manure, under which it is grown. Professor Anderson has lately found considerable difference in the composition of both swedes and mangolds grown on different manures, and it is well known that mangolds grown in France and Southern Germany contain much more saccharine matter than those grown in England; so much so, indeed, that while the manufacture of sugar from the beet is a large and important trade in these countries, an attempt made in England failed owing to this circumstance. In perusing the results of analyses of the mangold, we have remarked that the percentage of water is almost invariably greater in mangolds grown in Scotland than in those grown in England; it is very probable, therefore, that the latter may be the more nutritious of the two. Is it not possible, too, that Scotch-grown swedes may, on the other hand, contain more nutriment than those of English growth, the climate of Scotland being so peculiarly suitable for the cultivation of the swede? The relative sizes of the crops of swedes and mangolds, which are produced under similar treatment in the south of Scotland, may be pretty nearly in the proportion of three of the former to two of the latter; so that unless the feeding value of mangolds can be shown to exceed that of swedes in the proportion of three to two, there is no inducement to grow a greater breadth of mangolds than is necessary for spring use, when swedes fail. And as this ratio, judging from the above detailed experiments, seems quite out of the question, we do not think of investigating this subject further. In those large districts, however, of central England, where as large crops of mangolds as of swedes can be grown, and where the relative breadths of these crops depend only on their feeding values, such experiments would be of great importance. Whether the same results as those given above would be got there, can only be known by trial.

TABLE IV.—Weight of the Cows in Pounds.

Lot.	Jan. 4.	February 1.				March 1.				March 29.				Total Gain on		Results.
	Weight.	Weight.	How fed.	Gain	Loss	Weight.	How fed.	Gain	Loss	Weight.	How fed.	Gain	Loss	Swedes	Mang.	
1 *a*	889	896	S.	7	...	898	M.	2	...	904	S.	6	...	86	35	= 51 lbs. in favour of *Swedes*.
1 *b*	985	976	,,	...	9	968	,,	...	8	981	,,	13	...			
2 *a*	821	839	M.	18	...	873	S.	34	...	888	M.	15	...			4 in favour of Swedes.
2 *b*	916	896	,,	...	20	931	,,	35	...	959	,,	28	...			None in favour of Mangolds.
3 *a*	924	906	S.	...	18	932	M.	26	...	946	S.	14	...	22	4	= 18 lbs. in favour of *Swedes*.
3 *b*	948	922	,,	...	26	940	,,	18	...	960	,,	20	...			
4 *a*	957	934	M.	...	23	948	S.	14	...	939	M.	...	9			2 cows in favour of Swedes.
4 *b*	970	974	,,	4	...	992	,,	18	...	980	,,	...	12			2 cows in favour of Mangolds.

TABLE V.—Weight of the Milk Given in Pounds and Ounces.

Lot.	February 1.		March 1.				March 29.				Total given on		Results.
	Weight.	How fed.	Weight.	How fed.	Gain.	Loss.	Weight.	How fed.	Gain.	Loss.	Swedes.	Mangolds	
1 *a*	497·14	S.	462	M.	...	35·14	526·6	S.	63·6	...	2552·7	2531·1	= 21 lbs. 6 oz. in favour of *Swedes*.
1 *b*	375·8	,,	329	,,	...	46·8	332·12	,,	3·12	...			
2 *a*	366·10	M.	382·10	S.	16	...	413·1	M.	30·7	...			3 in favour of Swedes.
2 *b*	450·12	,,	438·5	,,	...	12·7	509·10	,,	71·5	...			1 in favour of Mangolds.
3 *a*	430·15	S.	365·7	M.	...	65·8	391·11	S.	26·4	...	3163·12	2928·1	= 231 lbs. 11 oz. in favour of *Swedes*.
3 *b*	754·13	,,	639.12	,,	...	115·1	660·14	,,	21·2	...			
4 *a*	487·5	M.	472	S.	...	15·5	499·14	M.	27·14	...			2 in favour of Swedes.
4 *b*	462·10	,,	453·7	,,	...	9·3	473·1	,,	19·10	...			2 in favour of Mangolds.

TABLE VI.—Percentage of Cream.

Lot.	January 31. Per cent.	January 31. How fed.	February 28. Per cent.	February 28. How fed.	March 28. Per cent.	March 28. How fed.	Average on Swedes.	Average on Mangolds	Total Average on Swedes.	Total Average on Mangolds	Results.
1 *a*	13	S.	13	M.	11	S.	12	13	12·125	13·375	= 1·25, or 1¼ per cent. in favour of *Mangolds*.
1 *b*	14	,,	16	,,	15	,,	14·5	16			4 in favour of Mangolds.
2 *a*	14	M.	13	S.	13	M.	13	13·5			None in favour of Swedes.
2 *b*	11	,,	9	,,	11	,,	9	11			
3 *a*	14	S.	16	M.	16	S.	15	16	13·750	13·875	= ·125, or ⅛ per cent. in favour of *Mangolds*.
3 *b*	13	,,	12	,,	13	,,	13	12			2 in favour of Mangolds.
4 *a*	14	M.	13	S.	13	M.	13	13·5			1 in favour of Swedes.
4 *b*	13	,,	14	,,	15	,,	14	14			1 equally in favour of both.

Colour of the Skimmed Milk by the Lactoscope.

Lot.	January 31. Colour.	January 31. How fed.	February 28. Colour.	February 28. How fed.	March 28. Colour.	March 28. How fed.	Average from Swedes.	Average from Mangolds	Total Average from Swedes.	Total Average from Mangolds	Results.
1 *a*	5	S.	5	M.	6	S.	5·5	5	6·1	5·5	= ·6, or $\frac{6}{10}$ of a shade in favour of *Swedes*.
1 *b*	6	,,	7	,,	6	,,	6	7			3 in favour of Swedes.
2 *a*	4	M.	6	S.	5	M.	6	4·5			1 in favour of Mangolds.
2 *b*	5	,,	7	,,	6	,,	7	5·5			
3 *a*	6	S.	6	M.	6	S.	6	6	6·5	5·6	= ·9, or $\frac{9}{10}$ of a shade in favour of *Swedes*.
3 *b*	5	,,	7	,,	7	,,	6	7			2 in favour of Swedes.
4 *a*	4	M.	6	S.	5	M.	6	4·5			1 in favour of Mangolds.
4 *b*	4	,,	8	,,	6	,,	8	5			1 equally in favour of both.

TABLE VI. *continued.*—Butter, in Pounds, from two Pounds. Cream Churned at 60°.

Lot.	January 31.		February 28.		March 28.		Average from		Total Average from		Results.
	Weight.	How fed.	Weight.	How fed.	Weight.	How fed.	Swedes.	Mangolds.	Swedes.	Mangolds.	
1	·365	S.	·433	M.	·398	S.	·381	·433	·423	·438	= ·015, or ¾ per cent. in favour of Mangolds.
2	·414	M.	·466	S.	·470	M.	·466	·442			
3	·486	S.	·512	M.	·460	S.	·473	·512	·472	·503	= ·31 or 1½ per cent. in favour of Mangolds; 3 in favour of Mangolds; 1 in favour of Swedes.
4	·533	M.	·472	S.	·455	M.	·472	·494			

Colour of the Butter, by the Butterscope.

Lot.	January 31.		February 28.		March 28.		Average from		Total Average from		Results.
	Colour.	How fed.	Colour.	How fed.	Colour.	How fed.	Swedes.	Mangolds.	Swedes.	Mangolds.	
1	8	S.	1	M.	6	S.	7	1	7·25	1·25	= 6 shades in favour of *Swedes.*
2	1	M.	7	S.	2	M.	7	1·5			
3	8	S.	2	M.	8	S.	8	2			All in favour of Swedes.
4	1	M.	7	S.	2	M.	7	1·5			

Quality of the Butter.

Lot.	January 31.		February 28.		March 28.		Average from		Total Number from		Results.
	Order.	How fed.	Order.	How fed.	Order.	How fed	Swedes.	Mangolds.	Swedes.	Mangolds.	
1	4th	S.	4th	M.	4th	S.	4	4	18	12	= 6 in favour of Mangolds; 2 in favour of Mangolds; 1 in favour of Swedes; 1 equally in favour of both.
2	2d	M.	1st	S.	1st	M.	1	1·5			
3	3d	S.	2d	M.	3d	S.	3	2			
4	1st	M.	3d	S.	2d	M.	3	1·5			

The manures applied for the swedes and mangolds used in these experiments were the same in both years, and are what we usually apply for these crops, viz., 25 cubic yards farm-yard dung, and in addition, 4 cwts. Peruvian guano, 1 cwt. superphosphate (containing 35% "soluble phosphates"), and 2 cwts. common salt per acre, to the mangolds; and 3 cwts. guano and 2 cwts. superphosphate to the swedes.

Samples of the roots were sent to Professor Anderson for analysis. The following are the results :—

	Swedes.	*Mangolds.*
Water, . . .	90·85	86·99
Albuminous Compounds, .	·81	1·08
Other Organic Matter, .	7·65	11·02
Ash, . . .	·69	·91
	100·00	100·00
Phosphoric Acid in Ash, .	9·94	13·53
Do. in plant, .	·068	·123

Considering that there are some apparent anomalies visible in these experiments, it is quite possible that the results may be partly fortuitous, or, at least, that they may have been affected by unnoticed causes; and that, even under like conditions, results differing to some extent from these might be got. We say this not that we wish the reader to think that these experiments have been carelessly made, or that somehow or other he should put no confidence in them, but to guard him against a prevailing tendency to rely too implicitly in the results of single experiments. We confess our own confidence in the superior feeding value of mangolds has received a shake severe enough to induce us hereafter to grow a quantity of mangolds sufficient only to fill the gap in April and beginning of May, between the last of the swedes and the first of the pastures.

III. *Some Experiments on the Comparative Feeding Values of Beanmeal and Oatmeal,* 1864.

Since the repeal of the Corn Laws, an excellent market has been opened in Britain for the superfluous grain of other countries; and during the last twenty years the invention of labour-saving machinery, and the cheapening of transit, have placed the foreigner on a much better footing for successful competition in our markets than he ever held at any previous period. The consequence is, that an immense trade has been gradually developed, our grain markets are glutted with enormous importations, and cereals can no longer be grown in this country with the same remuneration. The importation of dairy produce, and especially

of butcher meat, live or dead, has not, on the other hand, increased in anything like the same proportion; and as the consumption of these has gone on with the increasing population in a greater ratio than they have been produced, the prices of both have risen to an unprecedented height. Acute and far-sighted men tell us that this state of matters—the decreased price of corn, and the increased price of meat—is likely, from the above and other causes, to continue; and a general impression prevails that the British farmer, in order to live by his business, or to compete on anything like equal terms with his foreign rival, must now turn his attention in a greater degree than hitherto to the production of these indispensable luxuries of life—butcher meat and dairy produce.

It is universally admitted that concentrated foods are now as indispensable in the profitable feeding of animals as are auxiliary manures in the profitable culture of plants; and it is of as much importance to know the cheapest and best kinds of food to apply for particular purposes, as it is to know the cheapest and best kinds of manures to apply to particular crops. When we make a tour through the northern and eastern districts of Scotland, we find the farmers there feed for butcher-meat, and that they use linseed cake; and when we go into the south-western districts, we find they feed there for dairy produce, and that they use beanmeal. This is how ordinary practice—call it empirical practice if you will—has decided; and he requires to be well assured that he is right who dares to violate widely spread and well established practices, even when these may have been the result of mere empiricism. We may assume, therefore, in the absence of other proof, that linseed cake and beanmeal are not only highly nutritious foods, but also that they are the cheapest and best (mixtures excluded) for the production of the substances for which they are respectively used. But while granting this, it will still be evident that they can only be the cheapest while they bear a certain relative price to other foods, and that if this relation be disturbed, other foods may become cheaper than they are. Now we venture to think that the relative prices of beanmeal and oatmeal at present (1864) are such as to merit an inquiry whether, under certain circumstances, the latter may not be profitably employed in preference to the former. It is manifestly an advantage when a feeding stuff can be produced on the farm. Now, although beans may be grown with profit on some farms, yet, on by far the larger number throughout Scotland they are not nearly so profitable a crop as oats, and on many farms they cannot be grown at all. During the past two years, in common with other farmers, we have been selling our oatmeal and buying our beanmeal as usual; but instead of making a nominal gain of from 6s. to 8s. per load of 280 lbs., we have only got from 2s. to

5s.; and indeed, occasionally, when the price of oatmeal was so low as 25s. per load, we had to pay the same figure for beanmeal. In these circumstances, besides the trouble and risk, there was the loss consequent upon the extra preparation for market, and the cartage both to and from. It therefore occurred to us, that an experiment on the comparative feeding values of beanmeal and oatmeal would be of some importance.

On March 16, 1864, four feeding beasts and four milch cows were chosen from our stock, and were put up in lots of two in each, and were fed exactly alike till March 30th. All the animals were of the Ayrshire breed, and were as nearly alike in size, age, and condition, as we had. The milch cows in lot 1 had both calved in December 1863, and those in lot 2, in February 1864. The allowance of food to each lot, and the hours at which it was given during the whole course of the experiment, from March 30th till June 1st, was as follows:—

5 A.M.—37⅓ lbs. mangolds, and 2 lbs. hay chaff steamed, and 5⅓ lbs. meal (bean or oat as the case may be), ⅓ lb. treacle, and 6 oz. salt mixed with them.
5·30 A.M.—4 lbs. hay.
9·30 A.M.—4 lbs. hay, and water *ad lib.*
11 A.M.—Steamed mess, as at 5 A.M.
11·30 A.M.—4 lbs. hay.
5 P.M.—Steamed mess, as at 5 A.M.
7·30 P.M.—4 lbs. hay, and water *ad lib.*

Being a daily allowance to each animal of 56 lbs. mangolds, 3 lbs. hay chaff, 8 lbs. meal (bean or oat), 8 lbs. hay, ½ lb. treacle,* 6 oz. salt.

On March 30th all the animals were weighed, and the lots 1 (of both beasts and cows) were put upon the beanmeal diet, and the lots 2 upon the oatmeal. After the lapse of twenty-eight days, on April 27th, they were again weighed, and the lots 1 were changed to the oatmeal diet, and the lots 2 to the beanmeal. They were weighed after the interval of a week, on May 4th, and again, after another period of twenty-eight days, on June 1st, when the experiment was concluded. These weighings will be found in Tables I. and II.

The milk given was weighed, morning and evening, as drawn from the cows. The total quantity given in each period of twenty-eight days will be found in Table III.

Samples of the milk were taken for examination† on a convenient day in the last week of each period. The percentages of

* The treacle was given not only as a laxative, but as a condiment; cattle surfeit so readily on large quantities of meal—oatmeal especially.

† The methods of examination employed will be found fully detailed at page 59.

TABLE I.—Weights of the Feeding Beasts in Pounds.

Lot.	Mar. 30. Weight.	April 27. Weight.	How fed.	Gain.	May 4. Weight.	June 1. Weight.	How fed.	Gain.	Individual Effects in favour of Beanmeal.	Individual Effects in favour of Oatmeal.	Results.
1 *a*	964	1013	B	49	1009	1047	O	38	11		
1 *b*	963	986		23	1001	1058		57	...	34	= 51 lbs. in favour of *oatmeal*.
2 *a*	902	957	O	55	970	993	B	23	...	32	2 in favour of *oatmeal*.
2 *b*	936	968		32	979	1015		36	4	...	2 in favour of beanmeal.

TABLE II.—Weights of the Milch Cows in Pounds.

Lot.	Mar. 30. Weight.	April 27. Weight.	How fed.	Gain.	May 4. Weight.	June 1. Weight.	How fed.	Gain.	Individual Effects in favour of Beanmeal.	Individual Effects in favour of Oatmeal.	Results.
1 *a*	967	986	B	19	985	1020	O	35	...	16	= 25 lbs. in favour of *oatmeal*.
1 *b*	826	856		30	862	875		13	17		
2 *a*	802	830	O	28	838	858	B	20	...	8	3 in favour of oatmeal.
2 *b*	900	947		47	958	987		29	...	18	1 in favour of beanmeal.

TABLE III.—Weight of the Milk given.

Lot.	April 27. Weight.	How fed.	June 1. Weight.	How fed.	Individual Effects in favour of Beanmeal.	Individual Effects in favour of Oatmeal.	Results.
	lbs. oz.		lbs. oz.		lbs. oz.	lbs. oz.	
1 *a*	761 3	B	748 13	O	12 6	...	= 73 lbs. 11 ozs. in favour of *oatmeal*.
1 *b*	705 9		741 12		...	36 3	
2 *a*	699 0	O	706 7	B	7 7	...	2 in favour of oatmeal.
2 *b*	625 11		568 6		...	57 5	2 in favour of beanmeal.

TABLE IV.—PERCENTAGE OF CREAM.

LOT.	APRIL 23.				MAY 28.				Individual Effects in favour of		RESULTS.
	Morning	Evening	Average.	How fed.	Morning	Evening	Average.	How fed.	Beanmeal.	Oatmeal.	
1 *a*	12·0	11·0	11·5	B	12·5	11·5	12·00	O	...	·50	= ·25 or ¼ per cent. in favour of *beanmeal.*
1 *b*	11·0	10·0	10·5		11·0	10·5	10·75		·25		
2 *a*	13·0	12·0	12·5	O	13·0	13·0	13·00	B	·50	...	3 in favour of beanmeal.
2 *b*	11·5	10·5	11·0		11·5	12·0	11·75		·75	...	1 in favour of oatmeal.

TABLE V.—PERCENTAGE OF BUTTER.

LOT.	APRIL 23.				MAY 28.				Individual Effects in favour of		RESULTS.
	Morning	Evening	Average.	How fed.	Morning	Evening	Average.	How fed.	Beanmeal.	Oatmeal.	
1 *a*	2·523	2·250	2·386	B	2·316	2·493	2·404	O	...	·018	= 1·66 or 1⅔ per cent. in favour of *beanmeal.*
1 *b*	3·002	2·531	2·766		2·678	2·102	2·290		·376		
2 *a*	2·038	2·269	2·153	O	2·836	2·486	2·661	B	·508	...	2 in favour of beanmeal.
2 *b*	2·528	3·064	2·796		2·971	2·221	2·596		...	·200	2 in favour of oatmeal.

cream are given in Table IV., and the quantities of butter from 10 lbs. whole milk, churned at 66°, are given in Table V.

The specific gravities of the whole milk, the skimmed milk, and the whey, were also taken; the results, however, are so close, that it would only take up space unnecessarily to give them in detail, the difference (which was very slightly in favour of beanmeal) not being greater than is within the ordinary limit of error in weighing. The same remarks apply to the observations on the difference in the colour of the milk, or the comparative lengths of the time taken to churn it, and to the colour and quality of the butter. The difference may simply be put as *nil.*

During the two periods, of twenty-eight days each, the quantity of meal consumed by each lot was 896 lbs., or $3\frac{1}{5}$ loads. The gain in weight acquired by the feeding beasts when on oatmeal, over that acquired on the beanmeal, was 51 lbs. (Table I.) As the greater part of this must have gone to add to the "dead weight" of the animals, we shall strike off only 3 lbs. for offal, thus leaving 48 lbs. net. This quantity, at the moderate price of 4s. per stone of 8 lbs., gives 24s. According to this experiment and these calculations, then, if the beanmeal was worth 25s. per load, the oatmeal was worth 32s. 6d.; and their relative values for fattening cattle would stand as 10 is to 13.

Dealing with the milch cows' experiment in the same way, we have 25 lbs. gain in favour of oatmeal (Table II.), say 24 lbs. net. This, at the same rate as before, gives 12s. The 73 lbs. milk (Table III.), at the price of $3\frac{1}{2}$d. per imperial pint, would fetch just about 4s. In this case, if the beanmeal was worth 25s. per load, the oatmeal was worth exactly 30s. per load, and the proportionate values stand as 10 is to 12. We are not entitled, however, to conclude that oatmeal is thus much the better of the two as a milk producer; for if we throw aside the gain in weight, and take into account the increased quantity of milk only, the values would stand thus: beanmeal 25s., oatmeal 26s. 3d., or as 10 is to $10\frac{1}{2}$.

We invariably look with a certain degree of distrust on the deductions from single experiments—more especially if these have been on the feeding of animals—no matter how carefully or satisfactorily they may have been conducted. Experiments of this class are liable to so many causes of inaccuracy, that it is only when a considerable number have been made, on the same plan and under like conditions, that we feel entitled to make minute deductions; but the above seem to indicate that oatmeal possesses weight for weight, a considerably higher value than beanmeal for the production of fat, and that it is at least equally valuable with beanmeal for the production of milk.

REPORTS OF EXPERIMENTS WITH DIFFERENT TOP-DRESSINGS.

By Russell Swanwick, Whittington, Chesterfield.

I. *On Rye Grass and Clover, Crop* 1865.

[*Premium—The Gold Medal.*]

The following experiments on the action of nitrogen in different forms on the growth of rye-grass and clover were conducted on the farm of Fenton Barns, East Lothian, and the object was to ascertain whether the form in which nitrogen is applied materially alters its beneficial influence on the growth of rye-grass and clover.

The scale on which they were tried is recommended by Professor Anderson; and it is evident that, by taking the average result on a number of small plots, evenly distributed over the land, so as to correct any irregularity in the soil, closeness of plant, &c., greater accuracy may be obtained than by taking a single plot of much larger size. In this instance each experiment was made in quadruplicate (with the exception of one in duplicate), the plots being each $\frac{1}{112}$ acre imperial.

The field in which the experiments were tried lies about 40 feet above the sea-level; and from the laminated appearance of the subsoil, and the occasional sand banks, the valley in which it lies would appear to have been once a continuation of the Aberlady inlet. The soil is a heavy alluvial clay, and in high condition, judging from the previous cropping and manuring.

The crop experimented on consisted of red, yellow, and Alsike clovers, and Italian and perennial rye-grass.* These seeds had been sown the previous year in wheat, which yielded about 5 quarters per acre. The wheat had been preceded by a bare fallow, which had received 24 tons per acre imperial of Edinburgh town manure. This was the first bare fallow there had been on the farm for twenty years; but it was found advisable, owing to the wheat stubble having been deeply ploughed by steam rather late in the spring, and the great dryness of the season, which had rendered it impossible to reduce the soil to a tilth suitable for turnip seed. The cropping before the wheat had been beans, which had received 16 tons of farm-yard dung. The plant, both of clover and grass, looked well, and was standing 8 or 10 inches high at the time of the application of the dressings.

* The quantities sown were, for every 1¼ acre imperial,—red, 14 lbs.; yellow, 2 lbs.; Alsike, 2 lbs.; Italian rye-grass, 2 pecks; perennial, 1 peck.

The nitrogen contained in 56 lbs. ammonia (NH_3) is taken as a useful standard amount to be applied per acre. Thus, each plot of $\frac{1}{1\frac{1}{2}}$ acre receives such quantity of the nitrogenous manures as contain $\frac{1}{2}$ lb. ammonia, or of those which contain nitrogen equivalent to that in $\frac{1}{2}$ lb. ammonia.

The plots were carefully measured and marked out by strings fastened at the corners of each plot, and left there till the grass was cut. Thus the manures could be spread exactly; and when they were in such a fine powder as to be liable to float in the air, a broad plank was placed edgeways on the string to prevent the dust flying on to the adjoining plots.

The dressings, which were carefully weighed out for each individual plot, were applied on May 10 and 11, 1865.

This was late in the season to reap the full advantage from them; but an unforeseen delay arose, from the nitrate of ammonia and nitrate of lime having to be manufactured expressly, and then analysed.

It may, however, be safely inferred that the beneficial influence of the various dressings would have been greater had the dressings acted on the first crop for a longer time. This supposition is borne out by the fact, that the rest of the field in which the plots lay had received on April 18th a dressing of nitrate soda and sulphate ammonia, rather smaller than that applied on the experiments three weeks after, and had in that time grown 6 or 7 inches more than the part reserved to receive the trial dressings; and this advantage it continued to keep, after the experimental plots had received their dressing, up to the time of cutting.

The plots received as follows:—

1, 11, 21, 31, 10, 40. Nothing, being left as standards of comparison. They were interspersed as evenly as possible among the manured plots.

2, 12, 22, 32. Each 2 lbs. 10 oz. glue (estimated to contain 15 per cent. nitrogen, equivalent to 18 per cent. ammonia), containing nitrogen equal to that in $\frac{1}{2}$ lb. ammonia. The glue being very tough and unbreakable, was dissolved by heating the 2 lbs. 10 oz. in 3 gallons of water. This solution was poured on from a gardener's watering-can with a rose-end. The object of this experiment was to ascertain whether nitrogen contained in undecomposed animal matter is as valuable as when decomposed, and in the form of an ammonia salt, or a nitrate. Glue, though far too expensive to apply as a manure, is taken as typical of other undecomposed animal matter, and as one which does not contain other substances liable to interfere with the result of the nitrogen. It serves to test if it is expedient to allow the gelatine to be abstracted from the bones before using them for manure, and then supplying its loss by ammonia salts, or whether it is more economical to apply the gelatine itself in the bones.

3, 13, 23, 33. Each 1 lb. 15 oz. sulphate of ammonia (containing ½ lb. pure ammonia gas). It was sown in a fine powder.

4, 14, 24, 34. Each 1 lb. 9 oz. chloride ammonium sown in powder. In this, and the sulphate ammonia, all the nitrogen is contained in the form of ammonia; and if there is any difference between them in result, it must be owing to the hydrochloric and sulphuric acids which they contain.

5, 15, 25, 35. Each 1 lb. 2 oz. nitrate ammonia, dissolved for convenience, as the salt was in coarse crystals, in 1½ gallon of water, and applied in the same manner as the glue.

6, 16, 26, 36. Each 2 lbs. 6½ oz. nitrate of lime (also for convenience dissolved in water).

7, 17, 27, 37. Each 2 lbs. 8 oz. nitrate of soda, sown in powder. In the nitrate soda and nitrate of lime all the nitrogen is contained in the nitric acid; but besides this, the base is of some manurial value.

8, 18, 28, 38. Each 3 lbs. 9 oz. Peruvian guano, sown in powder. This quantity is estimated to contain ½ lb. ammonia, like all the other dressings. In addition to which, it contains phosphates and other salts in large quantities valuable for their manurial properties, so that this cannot be considered as a fair experiment, the result of which is to be compared with that of other nitrogenous substances not containing other salts.

9, 19, 29, 39. Each 1 lb. 1½ oz. sulphate ammonia, and 1 lb. 1½ oz. nitrate soda, both applied dry. These quantities of the two salts together contain the same quantity of nitrogen as ½ lb. ammonia. This dressing was applied as being the usual one which is given to grass in this neighbourhood, and helps to show whether a mixture of salts may not supply the wants of the grass and clover better than one salt.

20, 30. Each 1 lb. 9 oz. of chloride ammonium dissolved, and applied similarly to the other solutions. It was applied thus to see, by comparison with the chloride ammonium applied dry, if there was any difference in result when in solution and in powder. This was to make sure that those salts which were put on in solution had no unfair advantage over the others that were not. There was heavy rain directly after the dressings were all sown, thus giving those salts which are not deliquescent a comparative advantage, as it is in very dry seasons that deliquescent salts can be sown with such great advantage over non-deliquescent ones.

The edges and points of the leaves of the grass and clover on some of the plots seemed scorched by the dressings, but especially those on which the salts had been put in solution. The plots on which the sulphate ammonia, chloride ammonium, and the nitrate soda with sulphate ammonia were sown dry, were very slightly scorched. The plots on which the nitrate ammonia, nitrate of

lime, and chloride ammonium were applied in solution, were considerably scorched.

The greater scorching produced by those applied in solution probably arises from the solutions not being sufficiently dilute, and to their sticking to the leaves and blades, and burning them slightly, while those in powder sank down nearer the roots; and what little clung to the leaves was washed off them into the ground by the rain before it could be dissolved sufficiently to burn them.

During the period between the application and the end of May there were 3·6 inches of rain. During June up to the 26th, when the plots were cut, there was 0·3 inch. On June 14th the plots looked as follows:—

Sulphate ammonia, Chloride ammonium, " " in solution, Nitrate ammonia, " Nitrate lime, " Nitrate soda, Peruvian guano, Nitrate soda with sulphate ammonia,	Were all looking very well, and of a good dark colour. They appeared nearly equal; the Peruvian guano, however, looked rather the best.

Glue looked slightly less in quantity, and not such a good colour.

The blank plots looked decidedly the worst.

On June 20th the various dressings were looking relatively the same, except that the sulphate ammonia plots did not quite hold their position with the others.

On June 26th the grass on the plots was cut, weighed, and spread out for hay.

On July 5th it was weighed again as hay.

The observations made at the time of cutting were, that on the *nothing plots* the crop was the thinnest and lightest in colour. The grass stood about 3 feet high, the clover 20 inches. On the glue plots the crop was darker in colour than on the nothing plots, and the clover stood about 4 inches higher.

On the sulphate of ammonia plots the crop stood about the same height as on the glue plots, but was stronger and darker in colour, as far as the eye could judge, though the weighings make the crops almost equal.

On the chloride ammonium plots the crop stood the same height as the last, but there was considerable improvement in the thickness and colour.

On the nitrate ammonia plots the crop looked altogether about equal to that on the chloride ammonium plots.

On the nitrate of lime plots the crop was the same in appearance.

On the nitrate of soda plots the crop was the same in appearance.

On the Peruvian guano plots the height, thickness, and colour seemed better than on any of the others.

TABLE I.—Field Plan of Experiments on Grass and Clover, showing the arrangement of Plots, and the Weight produced on each of Grass and Hay in Pounds.

	1. Nothing.	13. Sulphate of ammonia.	25. Nitrate of ammonia.	40. Nothing.
Grass,	110½	126	152	115½
Hay,	38½	43½	48	36½
	2. Glue.	20. Chloride of ammonium in solution.	24. Chloride of ammonium.	39. Nitrate of soda and sulphate of ammonia.
Grass,	121½	139	157½	140½
Hay,	42½	44½	49	46
	3. Sulphate of ammonia.	16. Nitrate of lime.	23. Sulphate of ammonia.	38. Peruvian guano.
Grass,	119½	135½	140½	155½
Hay,	41½	44½	44½	51½
	4. Chloride of ammonium.	19. Nitrate of soda and sulphate of ammonia.	22. Glue.	37. Nitrate of soda.
Grass,	140½	149½	145½	146
Hay,	48	49	45½	47
	5. Nitrate of ammonia.	18. Peruvian guano.	21. Nothing.	36. Nitrate of lime.
Grass,	133½	163	123	112
Hay,	45½	52½	37½	40½
	6. Nitrate of lime.	12. Glue.	35. Nitrate of ammonia.	30. Chloride of ammonium in solution.
Grass,	131½	128	148½	157½
Hay,	46	40½	49½	47½
	7. Nitrate of soda.	15. Nitrate of ammonia.	29. Nitrate of soda and sulphate of ammonia.	34. Chloride of ammonium.
Grass,	131½	136½	130½	154½
Hay,	44	45½	45½	48½
	8. Peruvian guano.	11. Nothing.	27. Nitrate of soda.	33. Sulphate of ammonia.
Grass,	149½	115½	135½	122
Hay,	48	35	43	41½
	9. Nitrate of soda and sulphate of ammonia.	14. Chloride of ammonium.	28. Peruvian guano.	32. Glue.
Grass,	135	135	147½	132½
Hay,	45	46	50	43½
	10. Nothing.	17. Nitrate of soda.	26. Nitrate of lime.	31. Nothing.
Grass,	114½	136½	134½	113½
Hay,	38	47	46	36½

On the nitrate soda with sulphate ammonia plots the crop looked the next best after the guano both in thickness and colour, though it has not weighed so well as some of the others.

On the chloride ammonium in solution plots the crop looked nearly equal to that with the same dressing applied dry. Though, as will be seen from Table I., there is considerable variety in the weight of crop on the individual plots, yet the large crops balance the smaller, and the average on the four will thus approximate to the truth.

There is in one or two of the sets a plot whose crop deviates in weight out of all proportion from the greatest deviation of any of the other sets, and thus gives a false average, but the amount by which it is wrong will not be great, as the fault of the one is distributed over the four.

From Table I. it will be seen that the weight of crop on the four plots of the same manure varies slightly. This can scarcely be owing to the irregularity of the soil altogether; for take one of the worst plots, viz., 36: it is 21 lbs. below the average of the other three with the same manure, while those on each side of it are above the average of their quadruplicates. This variety was greatly owing to the plants not being equally close throughout.

The second crop received no additional dressings. It was cut on September 27th, being just 3 months since the removal of the first. During that time there had been rain to the amount of 6 inches, viz., during July, 2·7; August, 2·4; September 0·9;—total, 6·0.

At the time of cutting, the plots had the following appearance:—

On the nothing plots, the grass was rather thin, but the clover was very good.

Of the glue plots, the clover was not good on No. 2. No. 12 had been spoilt by the hay cock lying on it, and was therefore left out entirely. Nos. 22 and 32 had a very good crop of clover on them, and the grass also was good.

On the sulphate of ammonia plots the clover was bad, except on No. 23.

On the chloride of ammonium plots the clover was fair on the whole; on Nos. 4 and 24 it was good.

On the nitrate of ammonia plots the clover was poor.

On the nitrate of lime plots the clover was good on 16 and 26, but poor on 6 and 36.

On the nitrate of soda plots the grass and clover were very fair, except on 27, on which the clover was bad.

On the Peruvian guano plots the grass and clover were both good.

On the nitrate of soda with sulphate of ammonia plots the grass and clover were good, except on plot 29, which was very poor.

TABLE II.—Field Plan of Experiments on Grass and Clover, giving the Weight of Grass and Hay on each Plot of the Second Crop.

	1. Nothing.	13. Sulphate of ammonia.	25. Nitrate of ammonia.	40. Nothing.
Grass,	46½	43	46	56
Hay,	21½	20½	20	26
	2. Glue.	20. Chloride of ammonium in solution.	24. Chloride of ammonium dry.	39. Nitrate of soda and sulphate of ammonia.
Grass,	42½	61	59	67½
Hay,	20	28	28½	29½
	3. Sulphate of ammonium.	16. Nitrate of lime.	23. Sulphate of ammonia.	38. Peruvian guano.
Grass,	45	57½	62	64
Hay,	21½	24½	29½	29½
	4. Chloride of ammonium.	19. Nitrate of soda and sulphate of ammonia.	22. Glue.	37. Nitrate of soda.
Grass,	61	62	60	54
Hay,	27½	27	28½	23½
	5. Nitrate of ammonia.	18. Peruvian guano.	21. Nothing.	36. Nitrate of lime.
Grass,	52½			32
Hay,	24½	Spoilt.	Spoilt.	14
	6. Nitrate of lime.	12. Glue.	35. Nitrate of ammonia.	30. Chloride of ammonium in solution.
Grass,	48			43
Hay,	23	Spoilt.	Spoilt.	18½
	7. Nitrate of soda.	15. Nitrate of ammonia.	29. Nitrate of soda and sulphate of ammonia.	34. Chloride of ammonium.
Grass,	49½	47	43	45
Hay,	23½	20½	19	19
	8. Peruvian guano.	11. Nothing.	27. Nitrate of soda.	33. Sulphate of ammonia.
Grass,	60½	53½	38½	51½
Hay,	27	22½	17½	22½
	9. Nitrate of soda and sulphate of ammonia.	14. Chloride of ammonium.	28. Peruvian guano.	32. Glue.
Grass,	53	45½	51½	63
Hay,	25	20	24	31½
	10. Nothing.	17. Nitrate of soda.	26. Nitrate of lime.	31. Nothing.
Grass,	69½	66	61½	53½
Hay,	30	28½	30	24

Of the two chloride of ammonium in solution plots, one was poor while the other was good.

Plots 18, 21, 12, 35, were slightly spoilt by the hay cock of the first crop lying on them too long. They were, therefore, not considered at all in taking the average.

The results of the second crop are not so satisfactory as those of the first. The crops on the individual plots in each set vary more in weight, and their weights do not bear any definite relation to those of the first crop. This seems unaccountable, but there was the same extraordinary irregularity of second crop all over the field. There were strong patches of clover, and then, nearly bare places, scattered over the field. It did not appear that the best first crop was followed by either the best or worst second crop, or that the worst first gave the best second. There might have been a difference in the results, and a greater regularity, had the second crop been cut sooner, for on some of the plots the crop was over ripe at the time of cutting, and would thus have lost in weight considerably.

There is no doubt that the Peruvian guano—probably owing to the other salts which it contains beside the ammonia salt—is the most lasting in its effects, as it has produced far the best second crop.

The glue has had rather less effect on the first crop than the salts, but has had more on the second crop than any, except the Peruvian guano. This would indicate that it is not decomposed very rapidly, but requires some short time before it becomes available for the plant.

The mixture of nitrate of soda with sulphate of ammonia has slightly improved the second crop, instead of having diminished it, as the other ammonia salts and nitrates have done. This is satisfactory, as it is a usual top dressing in East Lothian.

The slight beneficial, and in some cases even hurtful, effect of some of the dressings on the second crop, may be owing to their having stimulated the early growth at the ultimate expense of the vigour of the clover plant, the grass being very equal on all as far as one could judge. The second crop of clover on the nothing plots being more, even, than that on any of the other plots, it would seem that all the dressings had injured the clover plant more or less, but that the Peruvian guano, glue, and nitrate of soda with sulphate of ammonia, have been able, by stimulating the remaining plants of clover, and more especially the grass, to make up for the fewer clover plants. Whether it is that the plant is quite used out, or that, having been stimulated once, it requires the stimulant to be kept up, might be tested, by applying a second dressing,—applying, at the same time, the same dressing to plots which have received nothing the first crop. This expe-

TABLE III.—Giving the calculated Crop of Grass and Hay per acre from Average Crop of each Dressing, and the Value of the Hay Crop at £4 per Ton.

	Dressings applied.									
	Nothing.	Glue.	Sulphate of Ammonia.	Chloride of Ammonium.	Nitrate of Ammonia.	Nitrate of Lime.	Nitrate of Soda.	Peruvian Guano.	Nitrate of Soda and Sulphate of Ammonia.	Chloride of Ammonium in solution.
	Tons. cwt. lb.	Tons. cwt. lb.	Tons. cwt. lb.	Tons. cwt. lb.	Tons. cwt. lb.	Tons. cwt. lb.	Tons. cwt. lb.	Tons. cwt. lb.	Tons. cwt. lb. Each	Tons. cwt. lb.
Weight of dressing per acre,	0 2 70	0 2 70	0 1 105	0 1 63	0 1 $17\frac{1}{2}$	0 2 $45\frac{1}{2}$	0 2 56	0 3 63	0 1 $10\frac{1}{2}$	0 1 63
Weight of first crop of grass per acre,	5 15 33	6 12 0	6 7 0	7 6 99	7 2 66	6 8 55	6 17 44	7 13 99	6 18 99	7 8 27
Weight of hay, first crop,	1 17 0	2 3 0	2 2 88	2 7 88	2 7 27	2 4 27	2 5 27	2 10 55	2 6 44	2 6 0
Weight of second crop of grass,	2 12 44	2 16 88	2 10 44	2 12 66	2 8 55	2 9 77	2 12 0	2 18 77	2 16 44	2 12 0
Weight of second crop as hay,	1 4 88	1 6 66	1 3 55	1 3 66	1 1 66	1 2 99	1 3 27	1 6 88	1 5 1	1 3 27
Total weight of both crops of grass,	8 7 77	9 8 89	8 17 45	9 19 56	9 11 11	8 18 22	9 9 45	10 12 69	9 15 30	10 0 27
Total weight of hay,	3 1 88	3 9 67	3 6 33	3 11 45	3 8 96	3 7 16	3 8 56	3 17 33	3 11 56	3 9 27
Value of hay at £4 per ton,	£12 7 0	£13 18 0	£13 5 0	£14 5 0	£13 15 0	£13 9 0	£13 14 0	£15 9 0	£14 6 0	£13 17 0
Cost of manure,			£1 10 0				£1 18 6	£2 7 4	£1 13 10	
Value of crop after deducting cost of manure,	£12 7 0		£11 15 0				£11 15 6	£13 1 8	£12 10 2	

The cost of applying had been added to the cost of manure. As, at the present prices, the cost of the other manures is far too high for their profitable use, their costs have not been given.

riment was not thought of till after the result of the second crop was known.

The object of these experiments, as stated in the beginning, is to ascertain whether the form in which nitrogen is applied materially alters its beneficial influence on the growth of rye-grass and clover.

There are so many disturbing influences, as of weather, state of soil, &c., which may affect the result of these and all other experiments, that it is unsafe to draw conclusions from them, unless they are supported by similar results, from experiments tried in different soils, in different years, and with different quantities of the dressings. It is particularly the case with these results, for some of them are contrary to those of previous experiments. Therefore, only the conclusions which these particular experiments on this soil suggest are given.

They are as follows :—

That undecomposed nitrogenous matter in a state of fine division is readily decomposed in the soil, and made available for the plant, and that in this undecomposed state it is of equal value with ammonia salts or nitrates, in its ultimate results, though it is not so quick in its action, and has not, therefore, such a stimulating effect on the first crop.

In the effects of the sulphate of ammonia and chloride of ammonium there is considerable difference, the latter giving a quarter of a ton more hay per acre than the former. The chloride gains its advantage in the first crop, as the second crops are equal. It would appear, therefore, that the acid has played an important part—the hydrochloric acid being, in this case, the more valuable of the two acids. Whether this is from the soil being deficient in chlorides, or whether from the chloride of ammonium having greater powers of diffusion through the soil than the sulphate, requires further attention. If the chloride of ammonium is more valuable as a dressing than the sulphate of ammonia, when applied in the quantities in which they were in this case,—that is, 1 cwt. 105 lbs. of sulphate, against 1 cwt. 63 lbs. of the chloride, then what a much greater crop would the chloride give, if 1 cwt. 105 lbs. were applied. Thus, if the chloride could be made at nearly the same cost as the sulphate, it might be a valuable manure.

The nitrate of ammonia has been very beneficial to the first crop, standing third best in its results on that crop, but it appears to have destroyed the ultimate vigour of the plant, as it has given the worst second crop of any of the dressings. This is probably owing to its being all spent on the first crop, as in the nitrate of ammonia the whole manurial value is in the two sources of nitrogen, while in the other dressings which have been used, the acid alone, or the base alone, contains the same quantity of

nitrogen as both acid and base in the nitrate of ammonia, and thus there is a base or an acid, as the case may be, which is in itself valuable ; as in the nitrate of soda there is the whole of the soda, besides the nitrogen, by the quantity of which the salt has been valued, and the more lasting effect of these dressings probably arises from this cause.

The nitrate of soda has increased the first crop more than the nitrate of lime, and nearly as much as the nitrate of ammonia; they, both of them, have had rather a better effect on the second crop than the nitrate of ammonia, while on that crop they are about equal to the sulphate of ammonia and the chloride of ammonium. They have not improved the first crop, however, quite as much as the chloride of ammonium, though they have done so more than the sulphate. Thus, as these nitrates stand in their results between the two ammonia salts, it cannot be inferred that nitrogen, in the form of a nitrate, is either more or less valuable than nitrogen in the form of ammonia.. The Peruvian guano has been far the most productive and profitable of any of the dressings ; but, as stated in remarking on the first and second crops individually, it is unfair to compare it as a source of ammonia alone, owing to the manurial value of the phosphates and other salts which it contains. These results, however, show that these salts are very valuable to rye-grass and clover, when there is rain soon after the guano is applied.

The mixed dressing of nitrate of soda and sulphate of ammonia has given the heaviest total crop after the guano. On the first crop it stands fourth best in its results, giving 4 cwt. less than the guano, and $1\frac{1}{2}$ cwt. less than the chloride of ammonium. On the second crop it appears to have done no damage, or rather has made up for the damage done to the clover by increasing the grass crop.

The chloride of ammonium in solution did not produce such a good first crop as the chloride of ammonium applied in powder. This is probably owing to its having scorched the plants more at first, for the second crops are almost equal. From this it may be inferred, that both the nitrate of lime and nitrate of ammonia might have produced larger first crops had they been applied in powder, or in more dilute solutions, as they are both caustic salts. Most experiments on the action of ammonia salts on clover appear to have shown that they are injurious to it. Yet in these, there can be no doubt that the first crop of *clover* stood higher and looked better in the plots which had received some nitrogenous dressing, than on the blank plots. This order was certainly, on the whole, reversed on the second crop.

From the irregularities of crop noticed on the various plots of the same experiment, there is no doubt that it would be more satisfactory were each experiment tried on six or eight plots, instead

of four, or on four plots of double the size, when there is a mixed crop of seeds and clover, as such a crop is always liable to have the clover and grass mixed rather irregularly.

As regards the profit on the various crops, it would have been far greater had the dressings been applied four weeks earlier. According to some experiments on the application of dressings at various times, the difference of crop on the dressed and undressed plots would have been doubled by a month's earlier application, and hence there would be profit, while in this case there is actual loss with some of the dressings.

II. *On Turnips, Crop* 1865.

[*Premium—Silver Medal.*]

These experiments, also conducted on the farm of Fenton-barns, were on the comparative effects on turnips of phosphates derived from animal and mineral sources when in combination with nitrogenous manures and alone, also on the comparative effects of phosphatic and ammoniacal manures.

The phosphates used are dissolved coprolites, dissolved bone ash, dissolved bones, and Bolivian guano (not dissolved). These were applied in such proportion to each plot as would supply 112 lbs. phosphoric acid (PO_5) per acre imperial.

The nitrogenous manures used were glue and sulphate of ammonia, applied in such proportion as would give nitrogen equal to that contained in 56 lbs. ammonia (NH_3) per acre.

The field chosen for the experiments lies between 40 and 50 feet above the sea level. The soil is a moderately heavy loam. The previous crop had been wheat, preceded by potatoes, which had received 12 tons farm-yard dung and 3 cwts. of Peruvian guano per acre. From the previous cropping and manuring the soil may be considered to have been in good condition.

The experimental plots were in triplicate, each plot being $\frac{1}{112}$th of an acre. They were carefully measured out and marked with cords. There being some slight irregularity in the soil of the field, the plots were so arranged as to correct this inequality. The dressings were sown on May 27th, in the drills, which were then ridged in and sown the same day with white globe turnip seed. The glue was applied as in the experiments on grass, by boiling the 2 lbs. 10 oz. allotted to each plot in about 3 gallons of water, and pouring this over the opened out drills.

The weather being dry after the turnips were sown, they came up slowly, and were eaten considerably by fly in parts. This made it difficult to estimate the relative speed of growth at the time of brairding. The nothing plots seemed to be slightly behind the rest at this time, while the rest of the field, which had

TABLE I.—Field Plan of Experiments on Turnips, showing the Weights of Crop (Bulbs alone) on each Plot in Imperial Stones and Pounds.

	6	5	4	3	2	1	
Manure applied.	Dissolved coprolites.	Glue.	Glue and Bolivian guano.	Glue and dissolved bones.	Glue and dissolved bone-ash.	Glue and dissolved coprolites.	A
Weight of bulbs.	21 st. 2 lbs.	23 st. 0 lbs.	24 st. 13 lbs.	22 st. 8 lbs.	21 st. 11 lbs.	23 st. 0 lbs.	
Manure applied.	Sulphate of ammonia and dissolved bone-ash.	Sulphate of ammonia and Bolivian guano.	Dissolved bone-ash.	Sulphate of ammonia and dissolved coprolites	Dissolved coprolites.	Nothing.	B
Weight of bulbs.	23 st. 6 lbs.	25 st. 11 lbs.	19 st. 8 lbs.	22 st. 8 lbs.	19 st. 10 lbs.	17 st. 8 lbs.	
Manure applied.	Dissolved bones.	Sulphate of ammonia and dissolved coprolites	Sulphate of ammonia and dissolved bone-ash.	Sulphate of ammonia and Bolivian guano.	Sulphate of ammonia and dissolved bones.	Bolivian guano.	C
Weight of bulbs.	22 st. 2 lbs.	25 st. 6 lbs.	23 st. 8 lbs.	22 st. 13 lbs.	20 st. 3 lbs.	18 st. 9 lbs.	

	12	11	10	9	8	7	
Manure applied.	Sulphate of ammonia and Bolivian guano.	Sulphate of ammonia.	Nothing.	Bolivian guano.	Dissolved bones.	Dissolved bone ash.	A
Weight of bulbs.	25 st. 0 lbs.	25 st. 0 lbs.	17 st. 7 lbs.	20 st. 8 lbs.	22 st. 5 lbs.	23 st. 7 lbs.	
Manure applied.	Glue and dissolved bones.	Glue and Bolivian guano.	Glue and dissolved bone-ash.	Glue and dissolved coprolites.	Nothing.	Bolivian guano.	B
Weight of bulbs.	24 st. 3 lbs.	24 st. 3 lbs.	23 st. 0 lbs.	24 st. 10 lbs.	19 st. 6 lbs.	24 st. 4 lbs.	
Manure applied.	Glue and dissolved coprolites.	Dissolved bone-ash.	Dissolved coprolites.	Nothing.	Glue.	Sulphate of ammonia.	C
Weight of bulbs.	22 st. 10 lbs.	18 st. 12 lbs.	16 st. 1 lb.	17 st. 7 lbs.	23 st. 11 lbs.	24 st. 1 lb.	

	16	15	14	13	
Manure applied.	Nothing.	Sulphate of ammonia and dissolved coprolites	Sulphate of ammonia and dissolved bone-ash.	Sulphate of ammonia and dissolved bones.	A
Weight of bulbs.	18 st. 7 lbs.	24 st. 8 lbs.	28 st. 1 lb.	28 st. 6 lbs.	
Manure applied.	Sulphate of ammonia and dissolved bones.	Glue.	Sulphate of ammonia.	Dissolved bones.	B
Weight of bulbs.	29 st. 4 lbs.	23 st. 11 lbs.	26 st. 3 lbs.	24 st. 12 lbs.	
Manure applied.	Nothing.	Bolivian guano.	Glue and dissolved bones.	Glue and dissolved bone-ash.	C
Weight of bulbs.	20 st. 0 lb.	21 st. 9 lbs.	25 st. 5 lbs.	26 st. 4 lbs.	

Note.—The plots 6 A, 6 B, 6 C, join the plots 7 A, 7 B, 7 C; and the plots 12 A, 12 B, 12 C, join the plots 13 A, 13 B, 13 C; thus the whole of the experiments are in one line of three plots broad.

received 12 tons of dung and 3 cwts. of Peruvian guano (this is far heavier manuring than any of the experiments), was decidedly in advance of any. This might be partly owing to the rows having been less exposed to the sun where the dung was put, than on the experimental plots, where they were exposed to a hot sun for four or five hours.

During June there was only 0·3 inch of rain. The rows were singled on June 29th.

On July 26th the nothing plots had fallen still more in the rear. Those which had received glue or sulphate of ammonia were looking rather better than those which had been dressed with phosphates alone. The rainfall during this month was 2·7 inches.

TABLE II.—Shows Weight of Turnip Crop per Acre, with each Manure and the Weight of Manure applied.

Kind of Manure.	Weight of Manure per acre. Cwts. lbs.	Weight of Crop. Tns. cwt.	Cost of Manure per Acre. £ s. d.
Glue, Dissolved coprolites,	2 70 5 70	16 $8\frac{1}{2}$	
Glue, Dissolved bone-ash,	2 70 5 70	16 $11\frac{1}{2}$	
Glue, Dissolved bones,	2 70 5 87	16 $16\frac{2}{3}$	
Glue, Bolivian guano,	2 70 3 24	16 $10\frac{1}{3}$	
Glue,	2 70	16 $9\frac{1}{2}$	
Dissolved coprolites,	5 70	13 $5\frac{2}{3}$	1 8 1
Dissolved bone-ash,	5 70	14 9	1 19 4
Dissolved bones,	5 87	16 $3\frac{2}{3}$	2 4 9
Bolivian guano,	3 24	16 $0\frac{1}{3}$	1 4 1
Nothing.		12 17	
Sal ammoniam,	1 105	17 11	1 9 1
Sal ammonia, Bolivian guano,	1 105 3 24	17 4	2 13 2
Sal ammonia, Dissolved bones,	1 105 5 87	18 3	3 13 10
Sal ammonia, Dissolved bone-ash,	1 105 5 70	17 $10\frac{1}{3}$	3 8 10
Sal ammonia, Dissolved coprolites,	1 105 5 70	16 $18\frac{2}{3}$	2 17 2
Nothing.		12 $18\frac{2}{3}$	
12 tons dung, 3 cwts. guano.		18 $14\frac{2}{3}$	5 0 0

The cost of the glue per acre is not given, as glue is merely taken as typical of other undecomposed nitrogenous matter. It cost £63 per ton.

On August 27th the order of merit was about the same as in July. The sulphate of ammonia with dissolved bones looked about the best. The rainfall this month had been 2·4 inches.

The turnips were pulled, shawed, and weighed the last week in November, when the weights of the bulbs alone on each plot were as shown in Table I.

The weight of the crop on the rest of the field was estimated by taking the average on several plots which were similarly distributed over the field to the experimental plots. The weight of crop per acre is calculated from the average weight on the triplicates, and is shown in Table II.

In this table it will be seen that of the phosphates the dissolved bones and Bolivian guano have had the best effect. This may to some extent be owing to their containing more nitrogenous matter than the other phosphates. The bone-ash stands next best of the phosphates, and the coprolites is the worst, with only an increased crop of 8 cwts. above the nothing plots. The phosphates in combination with glue have produced a very slight increase above the glue alone. The phosphates in combination with sulphate of ammonia have produced scarcely any additional crop above that from sulphate of ammonia alone, and in some cases seem actually to have lessened it. The sulphate of ammonia with dissolved bones is the best. The sulphate of ammonia has on the whole produced about 1 ton heavier crop per acre than the glue.

From these data it is evident, that on the particular soil in question, and during the season of 1865, nitrogenous manures were of far greater value to the turnip crop than phosphates; and of the phosphates, that the animal phosphates were more valuable than the mineral.

III. *On Wheat, Crop* 1865.

[*Premium—The Medium Gold Medal.*]

The following experiments on the comparative effect on wheat of phosphates derived from animal and mineral sources, when in combination with nitrogenous manures, and alone, also on the effect of phosphates as compared with ammonia salts, were likewise conducted on the farm of Fentonbarns.

These experiments were made with the same manures, and applied in the same quantities, as in the turnip experiments. The plots were the same size, viz., $\frac{1}{112}$ acre, but as the soil was of very even quality, and the wheat plant also even, the manures were only tried in duplicate. The field chosen lies 100 feet above the sea level. The wheat (Fenton wheat) had been sown on November 10, 1864. The ground had been prepared for it by Howard's steam cultivator on the 8th. It was very dry, con-

sidering the amount of rain which had fallen during the previous week, viz., 8 inches in eight days. The soil is a strong loam. The previous cropping had been potatoes in 1864, and oats in 1863, and the land was considered to be in good condition. The dressings were applied on May 13th, when the wheat was looking very well, and of a good dark colour. The manures were applied dry, as a top-dressing, and there were several good showers immediately after their application.

TABLE I.—Field-Plan showing the Distribution of Plots.

1. Glue and dissolved coprolites.	28. Dissolved coprolites.
2. Glue and dissolved bone-ash.	27. Sulphate of ammonia.
3. Glue and dissolved bones.	26. Sulphate of ammonia and dissolved coprolites.
4. Glue and Bolivian guano.	25. Sulphate of ammonia and dissolved bone-ash.
5. Glue.	24. Sulphate of ammonia and dissolved bones.
6. Bolivian guano.	23. Sulphate of ammonia and Bolivian guano.
7. Dissolved coprolites.	22. Dissolved bones.

8. Dissolved bone-ash.	21. Bolivian guano.
9. Sulphate of ammonia and dissolved coprolites.	20. Dissolved bones.
10. Sulphate of ammonia and dissolved bone-ash.	19. Glue.
11. Sulphate of ammonia and dissolved bones.	18. Glue and dissolved coprolites.
12. Sulphate of ammonia and Bolivian guano.	17. Glue and dissolved bone-ash.
13. Sulphate of ammonia.	16. Glue and dissolved bones.
14. Dissolved bone-ash.	15. Glue and Bolivian guano.

Table of Rainfall.

After application to end of May, . .	3·0 inches.
During June, ...	0·3 „
„ July, ...	2·7 „
„ August, up to harvest, . .	2·0 „
About, ...	8 „

On June 22d the colour of the various plots was well marked. Those which had received glue were looking a good dark colour; those with sulphate of ammonia were if anything rather better in colour, and the wheat stood a little higher, while those with phosphates alone were the worst. Of these latter, the plots with dissolved bones looked the best.

On August 23d the plots were cut. Those with sulphate of

TABLE II.

Name of Manure applied	Cwt. lb. Glue, . . 2 70 Dissolved coprolites, 5 70	Glue, . . 2 70 Dissolved bone-ash, 5 70	Glue, . . 2 70 Dissolved bones, . 5 87	Glue, . . 2 70 Bolivian guano, . 3 24	Glue, . . 2 70	Bolivian guano, . 3 24	Dissolved coprolites, 5 70	Dissolved bone-ash, 5 70	Sulphate ammonia, 1 105 Dissolved coprolites, 5 70	Sulphate ammonia, 1 105 Dissolved bone-ash, 5 70	Sulphate ammonia, 1 105 Dissolved bones, . 5 87	Sulphate ammonia, 1 105 Bolivian guano, . 3 24	Sulphate ammonia, 1 105	Dissolved bones, . 5 87	Nothing.
Weight of Grain.	T. ct. lb. 1 4 87	T. ct. lb. 1 3 84	T. ct. lb. 1 4 105	T. ct. lb. 1 4 28	T. ct. lb. 1 5 7	T. ct. lb. 1 1 21	T. ct. lb. 1 0 105	T. ct. lb. 1 0 81	T. ct. lb. 1 4 77	T. ct. lb. 1 4 77	T. ct. lb. 1 5 42	T. ct. lb. 1 4 50	T. ct. lb. 1 5 21	T. ct. lb. 1 2 38	T. ct. lb. 1 1 35
Weight of Straw.	1 18 0	1 16 0	1 16 56	1 16 28	1 15 84	1 12 56	1 11 56	1 13 56	2 2 28	1 19 84	2 2 0	1 18 56	1 18 0	1 14 56	1 13 84
Total Weight.	3 2 87	2 19 84	3 1 49	3 0 56	3 0 91	2 13 77	2 12 49	2 14 25	3 6 105	3 4 49	3 7 42	3 2 106	3 3 21	2 16 94	2 15 7
Weight per Bushel.	lbs. 61¾	lbs. 61⅞	lbs. 61⅝	lbs. 61¾	lbs. 63	lbs. 61⅞	lbs. 61¾	lbs. 61¼	lbs. 61⅞	lbs. 63	lbs. 62½	lbs. 61⅞	lbs. 62¾	lbs. 61¼	lbs. 61¼
Measure of Grain.	Qr. b. lb. 5 4 58	Qr. b. lb. 5 2 45	Qr. b. lb. 5 4 54	Qr. b. lb. 5 4 0	Qr. b. lb. 5 4 24	Qr. b. lb. 4 6 7	Qr. b. lb. 4 6 0	Qr. b. lb. 4 5 35	Qr. b. lb. 5 4 26	Qr. b. lb. 5 3 45	Qr. b. lb. 5 5 18	Qr. b. lb. 5 4 0	Qr. b. lb. 5 4 60	Qr. b. lb. 5 0 52	Qr. b. lb. 4 5 6
						£ s. d. 1 4 1	£ s. d. 1 8 1	£ s. d. 1 19 4	£ s. d. 3 13 10	£ s. d. 3 8 10	£ s. d. 3 13 10	£ s. d. 2 13 2	£ s. d. 1 9 1	£ s. d. 2 4 9	

ammonia were rather greener and more laid than those with glue. The ears on the latter looked quite as full as on the former. On the plots with phosphates alone the crop was considerably thinner, and the ears smaller. A piece of the field alongside the experiments was also cut, and from this the average of the unmanured part was taken.

The crops on the duplicates were put together and folded in sheets, and then all stacked in a stack by themselves. They were thrashed out the first week of October, when the weights of straw and corn were as seen in Table II.

It was noticed at the time of harvesting that there were bad patches in plots 15 and 17. This seemed to be owing to inequality in the soil, as the bad patches extended a few yards beyond the experimental plots. Thus the average of both the glue with dissolved bone-ash, and glue with Bolivian guano, will have been unfairly reduced by perhaps $\frac{1}{2}$ lb. on the plot of $\frac{1}{112}$ acre. If this is taken into consideration, it would raise the weight of grain on those two manures 56 lbs. per acre. Then the weights of grain from the plots with glue, and from those with glue and a phosphate together, will be found very nearly equal, and also equal to those from the plots with sulphate of ammonia and sulphate of ammonia with a phosphate. The weights from phosphates alone are considerably inferior, averaging 3 cwt. less of grain, and are only just equal with the unmanured portion.

The weight of straw seems to have been increased most by a nitrogenous manure in combination with a phosphate, for it is less with glue alone than with glue together with a phosphate. It is the case with sulphate of ammonia. The dissolved coprolites with sulphate ammonia, and dissolved bones with sulphate ammonia, have increased the straw more than any of the others, and have also given a good weight of grain.

It would thus appear on the whole that sulphate of ammonia has increased the grain about the same as the glue, but has increased the straw considerably more. This is probably owing to the sulphate ammonia being immediately available, and thus stimulating the early growth of the plant, while the glue required some short time before becoming available, and then at the time the ear was filling was equally efficacious with the sulphate ammonia.

The phosphates alone seem to have had no effect on the grain, and only a very slight effect on the straw. In combination with either glue or sulphate ammonia, they have not increased the grain at all, but have increased the straw. The extremely small effect of all the phosphates may to some extent be owing to their only having been applied as a top-dressing, and not harrowed in.

From these results it is evident that nitrogenous manures have been far the most profitable in their effect on the wheat crop.

REPORT OF FIELD EXPERIMENTS

ON THE ACTION OF AN EQUAL MONEY VALUE OF DIFFERENT TOP-DRESSINGS ON WHEAT, GRASS, AND CABBAGE IN 1866.

By Russell Swanwick, Whittington, Chesterfield.

[*Premium—The Gold Medal.*]

In these experiments the money value of the dressing was taken as the most convenient standard, there not being sufficient time to have the manures analysed, and so prepared as to apportion exactly equal quantities of the valuable constituents. The price of 3 cwt. of the best Peruvian guano at £13 per ton was taken as a standard value to be applied per acre, and each dressing was applied in such quantity as to give that value, namely, 39s. per acre. Portions of all the dressings were placed in bottles, and carefully analysed, which analyses are given in Table I., so that any of the dressings being proportionately too high in price the error can be taken into account. The prices given for the manures are high, owing to their having been bought only in small quantities, but it was thought better to reckon the amount to be applied by these prices than to mislead by taking them too low. Manor Farm, on which these experiments were tried, is situated in Wiltshire, and lies on the Oxford clay, about 450 feet above the level of the sea. It is all the heaviest description of clay, and was until lately a complete wilderness. An interesting account of the improvements made by Mr Edmund Ruck is contained in the "Journal of the Royal Agricultural Society" of 1866, by Dr Voelcker.

EXPERIMENTS ON WHEAT.

The land on which these were tried is not yet under drained, but the clay is thrown up in ridges or "lands." These lands are 8 feet wide, and when first thrown up are raised about 6 or 8 inches above the furrow. The wheat (Shirreff's bearded white) had been drilled in the autumn on land hand dug—which method on this remarkably heavy land is found the best, and one digging at 26s. 8d. per acre equal to two or three ploughings—after mangolds, which had received 6 tons dung, 1½ cwt. salt, 1¼ guano, and 2½ superphosphate. Before the mangolds it had been under Italian ryegrass, fed off with cattle and sheep. Before that there had been a crop of wheat. The land must be considered as being in rather low condition, having been in possession of the present owner for only four years previous, and before that very badly farmed. An inferior part of the field was chosen, as the object of the experiments was not to see how large a crop could be obtained, but whether top-dressings applied on a poor crop would be remunerative. The dressings were applied on April

25th. This was, of course, far later than it should have been in order to reap the full benefit, but being unable to try them sooner, it was thought that if the dressings paid when applied at this time, *a fortiori*, would they pay if applied earlier. The plots were marked off by wires on these "lands," such a length being taken as made exactly $\frac{1}{5}\frac{1}{6}$th of an acre per plot, and the whole arranged as in Table II., from which it is seen that each manure was tried in duplicate. It was thought better in this case, owing to the ground being in "lands," and the consequent slight inequality in the height of the "lands," to adopt $\frac{1}{5}\frac{1}{6}$th of an acre as the size, instead of $\frac{1}{1}\frac{1}{2}$th of an acre, which Dr Anderson recommends in ordinary cases.

On May 16th the nitrate of soda, and all the dressings in which it occurred, looked the best, next the sulphate of ammonia, which at first had been rather scorched, and then the guano. All these looking far better than the nothing plots.

On June 26th they appeared in the following order:—1st, Nitrate of soda and sulphate ammonia. 2d and 3d, Nitrate of soda = to sulphate ammonia. 4th and 5th, Peruvian guano = Peruvian guano and nitrate of soda. 6th, Nothing.

On August 16th the plots appeared as follows to the eye:—1st and 2d, Peruvian guano and nitrate of soda = nitrate of soda and sulphate ammonia. 3d, 4th, and 5th, Peruvian guano = sulphate ammonia = nitrate of soda. The sulphate of ammonia appeared the most laid, and not quite as ripe as the rest.

The plots were cut on August 16th, the wheat remained in stook till the 25th, during which period the weather was dry and hot, so that it was in first-rate condition to thrash on that day. The weight of crop per plot of both grain and straw are seen in Table III. From the average weight on the duplicate plots the weight of grain and straw was calculated per acre, and by reckoning the bushel at 63 lbs. the yield by measure was obtained. This, together with the exact weight per bushel, is given in Table III., as well as the value of each crop, taking the average price of wheat at 48s. (which this far exceeded), and the price of straw at £2 per ton, which in this neighbourhood it usually exceeds. It is seen from this table, taking the increase of straw into consideration, that all the dressings have been remunerative.

The sulphate of ammonia alone has given rather the best results, giving a clear profit, above that of the ordinary crop, of 22s. in grain, and 30s. in grain and straw together. The profit from the other applications is seen in the table. It will be seen from the table of rainfall that the first five weeks were considerably drier than in the average of seasons, and during this period the nitrate of soda took the lead, and the guano did not do so well. Then, during June the rainfall of 4·4 inches was remark-

TABLE I.—Dressings on

	Wheat.		Grass.		Cabbage.	
	Dressing per acre.	Valuable constituents contained in each in lbs.	Dressing per acre.	Valuable constituents contained in each in lbs.	Dressing per acre.	Valuable constituents contained in each in lbs.
	Cwt. lbs.	lbs.	Cwt. lbs.	lbs.	Cwt. lbs.	lbs.
Nitrate of soda @ £16	2 49 =	52 NH_3	2 49 =	52 NH_3	2 49 =	52 NH_3
Sulphate ammonia @ £15, 10s.	2 56 =	68 NH_3	2 56 =	68 NH_3	2 56 =	68 NH_3
Peruvian guano @ £13	3 0 =	43 NH 34 PO_5 33 Alkalies	3 0 =	43 NH_3 34 PO_5 33 Alkalies	3 0 =	43 NH_3 34 PO_5 33 Alkalies
Nitrate soda @ £16	1 24½ =	26 NH_3	1 24½ =	26 NH_3		
Sulphate ammonia @ £15, 10s.	1 28 =	34 NH_3	1 28 =	34 NH_3		
Nitrate soda @ £16	0 91	45½ NH_3	...	...	0 91	45½ NH_3
Peruvian guano @ £13	2 0 =	23 PO_5 22 Alkalies	...	...	2 0 =	23 PO_5 22 Alkalies
Chloride potassium @ £13	...	...	3 0 =	144 KO		
Bone-ash sup.-phos. @ £5, 5s.	...	...	2 0 =	42 PO_5		
Chloride potassium @ £13	...	...	1 0 =	48 KO		
Sulphate ammonia @ £15, 10s.	...	...	1 0 =	27 NH_3		
Chloride potass @ £13	...	...	...	...	1 56 =	72 KO
Sulphate ammonia @ £15, 10s.	...	...	...	...	1 56 =	27 NH_3

Analysis of

Peruvian Guano.		*Superphosphate.*		
Moisture,	18·46	Moisture,	12·57	
Organic matter,	41·22	Organic matter,	9·09	
Phosphates,	20·22	Water of combination,		
Sand,	9·62	Mono-calcic phosphate,	13·08 =	9·19 PO_5
Alkalies,	10·48	Tri-calcic phosphate,	18·59 =	9·49 PO_5
	100·00	Sulphate of lime,	37·67	
Containing N = 10·72		Alkalies,	1·77	
PO_5 in alkalies, 1·		Sand,	7·23	

Chloride potassium, KCl = 80·76; Sulph. ammonia, NH_4SO_4 = 95 per cent.
Nitrate soda, $NaNO_6$ = 96·6 per cent.

ably high, and a great part of this came in one shower, when 2 inches fell in the extraordinarily short period of 2½ hours. This, it seems far from improbable, washed a good deal of the nitrate of soda, which is not held by the soil like ammonia salts, away, and will in great measure account for the inferiority of its results.

EXPERIMENTS ON PERMANENT PASTURE.

The permanent grass of the farm, till within the last few years, when the present owner bought it, did not yield a crop of hay worth harvesting. Since then, by dint of mole-draining, application of artificial manures, and feeding off sheep with artificial food, he has brought it to yield crops of grass and hay of the best quality. The part chosen for the experiments was a piece of very even quality, though by no means as productive as a large portion of the field. Sheep had been folded on it with artificial food the previous year, and for three successive years before that had received a dressing of salt, guano, and superphosphate, at the rate of 26s. per acre. The field chosen was tile drained 9 yards apart, about 20 years since, by a previous occupier, and is dry. The dressings were applied on May 5th. They were all tried in quadruplicate, in plots the $\frac{1}{80}$th of an acre, and in sowing the dressings care was taken not to sow within 3 inches of the wires, so as to prevent any error from the influence of the dressing spreading beyond its own plot. The grass at the time was, in that part of the field, not more than 3 inches high. The weather was rather dry for some days after the application, and for ten days the grass on some of the plots was slightly scorched, especially on the sulphate of ammonia and chloride of potassium plots.

On May 26th the plots appeared in the following order :—1st, Nitrate of soda with sulphate of ammonia. 2d, Nitrate of soda. 3d, Peruvian guano. 4th, Sulphate of ammonia. 5th, Superphosphate, with chloride of potassium and sulphate of ammonia. 6th, Nothing. 7th, Chloride of potassium; with this the land seemed dried up.

In using chloride potassium it was thought that it might have the effect of increasing the growth of clover. This, however, does not appear to have been the case when applied alone, though the mixture of the bone-ash with sulphate ammonia and chloride potassium seemed rather to have increased it, as well as to have thickened the bottom grass. The guano did this in a marked degree. The grass was cut and made into hay the last week in June, and weighed as hay on the 29th. The weights per plot are given in Table IV., which shows also the disposition of the plots. The period between the first and second cutting was not at all suitable for the production of a large second crop.

TABLE II.—Field Plan of Experiments on Wheat, showing the Position of the Plots, the Manure, and the Amount of Produce in Pounds.

	Nitrate of soda and sulph. ammonia.	Nothing.
Grain, . . .	30·5	18·3
Straw, . . .	81·5	41·2
Total, . .	112·0	59·5
	Peruvian guano.	Nitrate of soda.
Grain, . . .	29·8	28·2
Straw, . . .	82·2	85·3
Total, . .	112·0	113·5
	Nothing.	Sulph. ammonia.
Grain, . . .	19·8	35·2
Straw, . . .	61·7	76·8
Total, . .	81·5	112·0
	Peruvian guano and nitrate of soda.	Nitrate of soda and sulph. ammonia.
Grain, . . .	28·8	31·6
Straw, . . .	88·7	77·9
Total, . .	117·5	109·5
	Sulph. ammonia.	Nothing.
Grain, . . .	27·1	20·1
Straw, . . .	85·4	47·4
Total, . .	112·5	67·5
	Nitrate of soda.	Peruvian guano.
Grain, . . .	28·6	29·6
Straw, . . .	83·4	87·4
Total, . .	112·0	117·0
	Nothing.	Peruvian guano and nitrate of soda.
Grain, . . .	19·5	24·5
Straw, . . .	58·0	82·5
Total, . .	77·5	107·0

TABLE III.—Giving the Average Produce per Acre, the Grain in Quarters, Bushels, and Pounds, the Straw in Hundredweights, together with the Dressings and Estimated Cost. The Price of the Wheat to be reckoned at 6/ per Bushel, and the Straw at 2/ per Cwt.

	Nothing.				Nitrate of Soda, 2 cwt. 49 lbs. at £16 per ton, } = 39/0				Sulph. Ammonia, 2 cwts. 56 lbs. at £15, 10/ per ton, } = 38/9			
	Grain.	Straw.	Total.	Weight per bus.	Grain.	Straw.	Total.	Weight per bus.	Grain.	Straw.	Total.	Weight per bus.
	qrs. bus. lbs.	cwts.	cwts.	lbs.	qrs. bus. lbs.	cwts.	cwts.	lbs.	qrs. bus. lbs.	cwts.	cwts.	lbs.
Average per acre,	2 1 27	36	35·6	62·4	3 1 15	42	58	63·06	3 3 42	40	55·5	63·12
Price, . .	£5 4 0	£3 12 0	£8 16 0	...	£7 11 6	£4 4 0	£11 15 6	...	£8 6 0	£4 0 0	£12 6 0	
Gain, . .	...	...	...	...	£0 7 6	£0 12 0	£0 19 6	...	£1 2 0	£0 8 0	£1 10 0	

	Peruvian Guano, 2 cwts. at £13 per ton, Nitrate of Soda, 91 lbs. at £16 per ton, } = 39/0				Guano, 3 cwts. at £13 per ton = 39/0				Nitrate of Soda, 1 cwt. 24½ lbs. at £16 per ton, Sulph. Ammonia, 1 cwt. 28 lbs. at £15, 10/ per ton, } = 39/0			
	Grain.	Straw.	Total.	Weight per bus.	Grain.	Straw.	Total.	Weight per bus.	Grain.	Straw.	Total.	Weight per bus.
	qrs. bus. lbs.	cwts.	cwts.	lbs.	qrs. bus. lbs.	cwts.	cwts.	lbs.	qrs. bus. lbs.	cwts.	cwts.	lbs.
Average per acre,	2 7 42	42	55·3	62·4	3 2 46	42	58·9	62·6	3 3 40	39	53·5	63·2
Price, . .	£7 2 0	£4 4 0	£11 6 0	...	£8 0 0	£4 4 0	£12 4 0	...	£8 6 0	£3 18 0	£12 4 0	
Gain, . .	Loss, 2s.	£0 12 0	£0 10 0	...	£0 16 0	£0 12 0	£1 8 0	...	£1 2 0	£0 6 0	£1 8 0	

With the exception of the week after the first cutting—namely, the last week of June, when the rain fell in such torrents as to run off the closely mown ground—there was considerably less than an average of rain up to the end of August. Then during September there was a large excess of rain, with remarkably cold, dull weather. In October, the weather was more suitable, and during this time the grass grew nearly as much as during the other three months. In the second cutting, owing to the difficulty of getting the grass cut dry, some time elapsed between the cuttings of the various plots, but they were always cut in sections, one complete series being cut at a time. Thus, section 1 was cut first during the last week of October. Sections 2 and 3 were cut on October 27th, and section 4 not till November 6th. The weights of grass appear in Tables IV. and V. In this latter table the hay has been valued at £4 per ton, and the grass at 7s. It will be seen from this that the nitrate of soda, with sulphate of ammonia, has paid best, and next the guano, and that the rest have only paid very slightly; and in the case of sulphate of ammonia alone, and chloride of potassium, there is a considerable loss. The dryness of the weather at the time of application, and the consequent scorching by the sulphate of ammonia, quite accounts for its not having succeeded, and points out the great importance of applying sulphate of ammonia very early, before there is much grass to be scorched, and when there is a probability of plenty of rain. The immediate profit from the guano, besides the benefit to the succeeding crop, which is evident already, shows that by an early application the guano would be the most profitable one at the prices at which the manures were taken, that is, on the soil in question, an analysis of which is given in the "Journal of the Royal Agricultural Society," referred to previously, and from which the soil appears poor in phosphates and alkalies. The slow effect of the mixture of bone-ash, superphosphate, with the chloride of potassium and sulphate of ammonia, is evident on the second crop, and on the young grass this spring; and if the chloride of potassium, which seems to have had little effect, had been replaced by sulphate of ammonia, the immediate effect might have been on a par with the guano.

EXPERIMENTS ON CABBAGE.

The land on which these experiments were tried is of much the same quality as the wheat land, but has only been broken up from permanent pasture four years. It was mole-drained then, but is still wet. The previous crop had been wheat, on the stubble of which a light dressing of four tons of dung had been spread, and ploughed in for the cabbage. The wheat had received a dressing of 1¼ cwt. of salt, 1½ cwt. of guano, and 2½

TABLE IV.—Field Plan of Experiments on Permanent Grass, showing the Position of the Plots, the Manure, and the Amount of Produce in Pounds, of 1st Crop as Hay and 2d Crop as Grass.

	IV.	III.	II.	I.
	Nothing.	Chloride potass.	Nothing.	Nitrate soda and sulphate ammonia.
1st Crop as Hay,	65	66	52	80
2d „ Grass,	157	217	111	125
	Bone-ash, sup.-phosphate with chloride potass. and sulphate ammonia.	Nitrate soda.	Bone-ash, sup.-phosphate with chloride potass. and sulphate ammonia.	Peruvian guano.
1st Crop as Hay,	73	72	65	77
2d „ Grass,	176	188	200	132
	Sulphate ammonia.	Nothing.	Sulphate ammonia.	Nothing.
1st Crop as Hay,	71	47	62	50
2d „ Grass,	164	175	186	108
	Chloride potass.	Nitrate soda and sulphate ammonia.	Chloride potass.	Sulphate ammonia.
1st Crop as Hay,	53	70	48	71
2d „ Grass,	147	199	174	120
	Nitrate soda.	Peruvian guano.	Nitrate soda.	Bone-ash, sup.-phosphate with chloride potass. and sulphate ammonia.
1st Crop as Hay,	70	74	72	76
2d „ Grass,	199	209	182	150
	Nothing.	Bone-ash, sup.-phosphate with chloride potass. and sulphate ammonia.	Nothing.	Chloride potass.
1st Crop as Hay,	56	71	62	60
2d „ Grass.	157	213	167	128
	Nitrate soda and sulphate ammonia.	Sulphate ammonia.	Nitrate soda and sulphate ammonia.	Nitrate soda.
1st Crop as Hay,	76	62	77	71
2d „ Grass,	173	195	195	135
	Peruvian guano.	Nothing.	Peruvian guano.	Nothing.
1st Crop as Hay,	76	42	69	47
2d „ Grass,	180	143	210	158

TABLE V.—Showing the Weight of 1st Crop as Hay and 2d Crop as Grass per Acre, with the Value of such Crop. Hay taken at £4 per Ton, and Grass at 7s.; and also the Loss or Gain after Deducting the Cost of Manure and the Value of the Unmanured Crop.

	Nothing.		Bone-ash, Superphos. 2 @ 5 5 with Chloride Potass., 1 @ 13 0 and Sulph. Ammonia, 1 @ 15 0 cwt. £ s. =39/		Sulphate Ammonia, 2 cwt. 56 lbs.		Chloride Potass., 3 cwt.	
	1st Crop as Hay.	2d Crop as Grass.	1st Crop as Hay.	2d Crop as Grass.	1st Crop as Hay.	2d Crop as Grass.	1st Crop as Hay.	2d Crop as Grass.
Average per Acre,	tons. cwt. lbs. 1 6 84	tons. cwt. lbs. 3 9 0	tons. cwt. lbs. 1 15 67	tons. cwt. lbs. 4 12 56	tons. cwt. lbs. 1 13 28	tons. cwt. lbs. 4 3 0	tons. cwt. lbs. 1 8 45	tons. cwt. lbs. 4 3 22
Value of Crop, .	£5 7 0	£1 4 0	£7 2 0	£1 12 0	£6 13 0	£1 9 0	£5 13 6	£1 9 0
Dr., . . . Cr., . . .			Gain of 3s.		Loss of 67s.		Loss of 29s.	

	Nitrate of Soda, 2 cwt. 49 lbs.		Nothing.		Nitrate of Soda, 1 cwt. 24½ lbs. and Sulph. Ammonia, 1 28		Peruvian Guano, 3 cwt.	
	1st Crop as Hay.	2d Crop as Grass.	1st Crop as Hay.	2d Crop as Grass.	1st Crop as Hay.	2d Crop as Grass.	1st Crop as Hay.	2d Crop as Grass.
Average per Acre,	tons. cwt. lbs. 1 15 67	tons. cwt. lbs. 4 8 0	tons. cwt. lbs. 1 5 100	tons. cwt. lbs. 3 18 0	tons. cwt. lbs. 1 17 100	tons. cwt. lbs. 4 6 56	tons. cwt. lbs. 1 17 0	tons. cwt. lbs. 4 11 56
Value of Crop, .	£7 2 0		£5 3 6		£7 11 6		£7 8 0	
Dr., . . . Cr., . . .	Gain, 1s. 8d.				Gain, 10s. 8d.		Gain, 8s. 10d.	

cwts. of superphosphate. The crop before had been seeds, before that wheat and permanent pasture.

The cabbages were drum head, and stood 8 to 9 inches high on May 14th, when the dressings were applied in quadruplicate on $\frac{1}{56}$th of an acre. The field was in "lands" like the wheat field. The dressings were applied along each row, of which there were three on a land. The advantage of dryness was plainly marked by the great superiority of the row on the middle of the "land" which stood the highest.

The cabbages grew pretty well till September, when, owing to the perpetually drizzling rain without sunshine—for there was only one day in the whole month when there was not rain—the cabbages became blighted, stopped growing, and lost their outside leaves. They were cut, and the heads weighed the first week in November.

Table VI. contains the weights per plot. Table VII. contains the calculated weight per acre.

It is seen from these tables that Peruvian guano has had a most marked effect, having nearly doubled the crop, the heads were far more compact, and there was less loose leaf. Ammonia salts, as well as the nitrates, have had a marked effect, though not equal to the guano.

The effect of these dressings has been so great on a very small crop, that the results lead to the conclusion that, under more favourable circumstances, the application of some of them would pay the farmer.

Table of Rainfall.

From April 23d to 30th,	. . . .	·8
„ May,	. . . . .	·8
„ June,	. . . . .	4·4
„ July 1st to 7th,	. . . .	1·
„ July 7th to 14th,	. . . .	·0
„ July 14th to 21st,	. . . .	·0
„ July 21st to 31st,	. . . .	·5
„ August 1st to 7th,	. . . .	·9
„ August 7th to 14th,	. . . .	·6
„ August 14th to 21st,	. . . .	·0
„ August 21st to 31st,	. . . .	·5
„ September 1st to 30th,	. . .	5·9
„ October 1st to 31st,	. . . .	2·
„ November 1st to 30th,	. . .	1·7

TABLE VI.—Field Plan of Experiments on Cabbage, showing the Position of the Plots, the Manures, and the Weight of Heads in Pounds.

	Nothing.	Peruvian guano and nitrate soda.	Nothing.	Peruvian guano and nitrate soda.
Heads,	134	300	184	263
	Chloride potass.	Chloride potass and sulph. ammonia.	Nitrate soda.	Chloride potass and sulph. ammonia.
Heads	118	173	170	181
	Peruvian guano.	Nothing.	Sulph. ammonia	Nothing.
Heads.	243	162	174	129
	Sulph. ammonia.	Chloride potass.	Peruvian guano.	Chloride potass.
Heads,	123	170	226	145
	Nitrate soda.	Peruvian guano.	Chloride potass. and sulph. ammonia.	Peruvian guano.
Heads,	120	348	233	258
	Nothing.	Nitrate soda.	Nothing.	Nitrate soda.
Heads,	137	340	191	209
	Peruvian guano and nitrate soda.	Sulph. ammonia.	Chloride potass.	Sulph. ammonia.
Heads,	275	368	224	207
	Chloride potass and sulph. ammonia.	Nothing.	Peruvian guano.	Nothing.
Heads,	181	190	346	150

TABLE VII.

Nothing.	Chloride Potass., 3 cwts.	Peruvian Guano, 3 cwt.	Sulph. Ammonia, 2 cwts. 56 lbs.	Nitrate Soda, 2 cwts. 49 lbs.	Nothing.	Per. Guano, . cwts. 2 lbs. 0 Nitrate Soda, . 0 91	Chloride Potass., cwts. 1 lbs. 56 Sulph. Ammonia, 1 56
Tns. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cwts.	Tons. cts.	Tons. cwts.	Tons. cwts.
3 16	4 2	7 $9\frac{1}{2}$	5 9	5 $4\frac{3}{4}$	4 $3\frac{1}{2}$	6 13	4 16

REPORT ON TURNIPS FOR SEED.

By John Morrison, Coney Park Nursery, Stirling.

[*Premium—Ten Sovereigns.*]

We are well aware of the great value of the turnip, both for feeding stock and dairy purposes. To preserve a true variety of it is at all times desirable: a good-shaped, firmly knit, juicy bulb, is the desideratum, and not to tax the land by producing a superabundance of leaves.

We shall endeavour to show how the former can be kept up to their present state of perfection, and the latter avoided. We classify them under four heads:—

I. The Swedish Turnip (*Brassica campestris rutabaga*).—This variety is of great value to farmers and others. It is rich in feeding qualities, hardier than any other known turnip, and much prized for spring use. It generally produces a heavy crop when raised on a suitable soil, which should be a strong friable loam, well drained, and freely manured with well-made farmyard gatherings. Its general cultivation is so well-known and practised in Scotland that I need say no more on this point.

We find from history that the turnip has been long in high favour, but whether grown to the same perfection in early times as at present is doubtful. However, we are told that they were esteemed good both for "man and beast"—a recommendation which would seem to indicate that they were of a fair size and quality; and there can be no doubt that cultivation has done much to improve the turnip in both. There is no other agricultural product more apt to run wild than the turnip. Indeed, the whole family of *Brassicas*, to which belong the cabbage, greens, &c., &c., are prone to intermix and sport to a greater or less degree; hence there is danger in allowing more than one variety to grow near each other for seed. At all events, we are on the safe side in guarding against it as much as possible. We must also be careful of sudden checks, as these have a tendency to promote premature flowering. There are numerous instances where turnips, when young, have received a check by frost, which caused them to run to flower instead of bulbing. There may also be cases where the rootlets, by exposure or otherwise, may not be able to keep pace with the growth; and there may be instances of the opposite. In the former there will be a tendency to produce leaves, &c., and in the latter they will more readily run to flower. These extremes, however, can in a great measure be controlled by careful cultivation.

Let the beginner be particularly cautious in his selection, situation, &c. We shall suppose that a farmer wishes to grow as much turnip seed of a certain sort as will serve him for a year

or two. Let him go over his field about the month of October, and make his selection of swedes, say two or more cart-loads, according to the wants of the farm.* Let him then look out a nice corner in some of his fields, either after potatoes, grain, or a lea field. A sprinkling of manure may be necessary on the lea, or after the grain crop. Open up a furrow with the plough, and plant the bulbs about twelve or fifteen inches apart; make other two furrows with the plough, then another row of turnips, and so on, firming the roots well by trampling and setting the soil properly about them.

The above plan is the very best for growing *stock* seed from; but should seed be wanted on an extensive scale for sale, do as already described for stock seed to begin with; then about June or July, after the regular crop of turnips is all sown and finished, prepare the ground for the seed turnip in a similar way as for an ordinary crop. Give an easy manuring, say about 20 tons per acre. Make up the drills in the usual way, but about four inches narrower between each; run the drill harrow over them before sowing, which will allow the turnips a better covering for winter, and raise them less above the natural level of the field. Sow and thin in the usual way, but in thinning leave the plants at least double the thickness you would for full-grown bulbs; hoe and clean thoroughly, and before winter sets in, be sure and give them a good earthing up to protect them from frost as much as possible, and this operation will also leave a clear furrow for surface water to run off more freely. In early spring let them have a sprinkling of guano, say from two to three cwts. per acre, and run the plough through them, which will greatly refresh them.

These remarks apply to dry field or light land generally, but in carse or heavy land the drills require to be the usual height, and no earthing up for winter. Such soils are much damper than dry field, and therefore apt to rot if covered, or in too low drills. There is some difference of opinion as to the manner in which the manure ought to be put on the land—some maintaining that if put into the drill in the ordinary way the bulbs will grow too long in autumn, get soft, and perish through the winter. My opinion is, that when the land is in good heart, by all means manure in autumn or winter, and cover in; but where the ground is poor, put the manure in the drill in the usual way without fear. I may here remark, that I have been connected with the growing and saving of seed for a great many years, and have seen numerous plans tried, but know of none more effective than that here recommended. It is the cleanliest and tidiest way, and will produce the best crop and the truest stock.

* One ordinary cart-load of turnips will produce about three-fourths of a bushel of seed.

To replant full-grown bulbs in autumn, or store them and plant in early spring, would not pay the labour by any extra amount of seed that might be obtained; and when left in the ground all winter, they are much more liable to be destroyed by the frost, &c., than the smaller and hardier bulbs. By the plan recommended, the bulbs will be about half the usual size of full-grown turnips, although there is another system practised by some of sowing them broadcast, when neither plough nor harrow can get through them for cleaning, and only thumb bulbs are obtained. This is such an untidy method that it is scarcely worth noticing; but in the case of swedes, I have sown in drills about one foot apart, and thinned out and transplanted like cabbage plants. This latter plan may do in a case of emergency, and a fair yield may be got in a favourable season, but it is not safe to continue the stock from such. Even with the plan above recommended for half-grown bulbs, the stock ought to be renewed from full-grown roots every third year. I do not mean to infer that they will not continue genuine for a longer period, but it is much safer to renew them at that interval.

We have now to wait for the flowering season, during which they ought to be gone over carefully, and all those differing in colour of bloom from the main stock pulled out. These are easily distinguished—the whiter or paler in colour the flesh of the turnip, the brighter the yellow of the blossom, and *vice versa*. This inspection ought to be gone about very carefully, as the purity of the stock depends in a great measure upon its being done thoroughly. But, indeed, however particular one may be in selecting their stock, some rogues are almost sure to escape detection, and the blooming season is the only opportunity for getting quit of such.

Nothing further is necessary until harvesting, which in average seasons will be about the end of July or beginning of August. Let the seed be well matured. Before cutting, examine the top pods, the seeds of which should be black, and the side shoots or laterals of a brown colour. It is quite safe to cut them, for if left to be dead ripe, or nearly so, the pods are very brittle, and much loss may follow. If the quantity is small, such as for stock or own use, cut, bind, and stook as with grain; but if by the acre or in quantity, cut and lay down in swathes, which may be easily turned. When properly dried, and all the seed perfectly black, and the pods quite free and crisp, choose a nice airy day, when it may be carted to the barn in close carts, and thrashed out at once. I do not approve of stacking. There is always a loss in handling much about it, so that it is much better to have the seed thrashed out immediately on being brought in-doors. If at all convenient, so soon as thrashed and cleaned, let it be spread out in the loft to dry thoroughly, and do not leave it lying in a

bing even for a single night. Nothing will heat more readily; and heated seed will always have a bad smell, spoiling the sample and growing power, and consequently be depreciated in value.

An average crop may be from 18 to 20 bushels per acre, although I have frequently seen harvested from 25 to 30 bushels per acre. Perhaps the latter is more the exception than the rule, as in bad seasons, by frost or blight, I have seen no more than three or four bushels per acre harvested; but after a thorough knowledge has been obtained by actual experience how and when to *tid* the necessary operations, the crops will increase in a corresponding degree. The swede is apt to run into a sort of stem, and in saving seed these ought to be avoided.

2. The Common Turnip (*Brassica Rapa*, Purple-top yellow).—They are rather difficult to keep pure, being liable to lose much of their yellow colour, and get very pale. They require careful attention, and the stock should be renewed frequently. I recollect of having a very fine stock of this variety both as to shape and purple colour, but deficient in the yellow. I picked about a couple of dozens of the very finest of them, and a like quantity of green-top yellow, rich in colour, and fine shape. I planted them together, striving to catch the yellow from the green-top, and thinking to impart it to the purple-top. From this stock the first year I had a strange assortment of purple, bronze, and green tops, and from these I picked about a dozen of the finest as to mould and colour it was ever my lot to look on. These I saved the third year, but was sadly disappointed to find green-tops still appearing; and for the third time I picked and saved with the same result. However, I recrossed them with the finest I could get from common stock of purple-top, and these I hybridised. In short, I was eight years in arriving at anything like perfection, but now I have got from this stock some real gems. The same treatment in sowing and harvesting as with the swedes will answer this variety, strict watch being kept over them when in flower to get quit of all the pale-fleshed ones, which, as formerly stated, are easily detected by the brightness of the flower.

3. Green-Top Yellow.—This turnip is, perhaps, somewhat softer than the purple-top, but is of equal if not superior quality, and the mode of cultivation is the same in every respect. In picking for stock seed, keep out all those with strong shaws and pale in colour.

4. White Globe.—A most beautiful turnip, large cropper, and excellent for feeding in early winter. It spoils sooner than any of those before described, but is very useful. It is rather difficult to get over the winter for seed. It should be sown rather later than those already referred to (indeed all the varieties here mentioned ought to be sown in the order given), for in a good

growing season they very soon rush up, and it is not safe to have them large for standing the winter. Well-drained, free soil is essentially necessary for them; and be more sparing with the manure than for the other varieties. Attend to them when in bloom; but in this variety leave all the bright yellow blossoms, and weed out those of a dull colour.

I trust the descriptions above, given under the respective headings, have been sufficiently plain, and will be easily understood. It is with the growing of turnip seed as with many things else,—we may be able to impart to others a good deal of what we know ourselves, but there are some important points which nothing but actual experience will enable us to understand. In aiding this knowledge the above is offered as a humble contribution.

REPORT ON HEDGEROW TREES.

By John Morrison, Coney Park Nursery, Stirling.

[*Premium—Silver Medal.*]

The beauty of the landscape is greatly enhanced when the country is studded with hedgerow trees, composed of different varieties, arranged in suitable groups, and dispersed in proper situations. The eye of the traveller looks wearily upon the far-stretching monotony of the plain, relieved though it may be to a certain extent by the distant mountain range, but destitute of the natural and attractive ornamentation which can be given to it only by trees. Their presence here and there dotting the land gives a cheerful and becoming variety; they stand out in the landscape as the more prominent and beautiful objects which nature places in the page of her book to please the eye of man. A bouquet to be admired must be composed of flowers not of one uniform size or colour, but of the smaller and the greater, and of various hues and shades, the one assisting to show off the proportions and loveliness of the other. And somewhat in the same manner the landscape shows to advantage by its well-disposed trees; for however diversified the scenery in other respects, and however highly cultivated the land may be, the view is tame and uninteresting, naked and barren, unless there be a proper admixture of the various forms and colours of trees to variegate and beautify the country.

Trees give light and shade to the prospect. There is the sombre hue of the forest, or the light and agreeable tint of the solitary specimen; while all the intermediate blendings or contrasts of colour are capable of being produced by skilful grouping. There is the feathery and wavy appearance of some, and the more dense and close-set form of others; the wide-spreading branches,

or the weeping drapery, the rounded shape, or the more graceful pyramidal habit of growth—all of which contribute to give a charm to the scene which it would not otherwise possess.

Hedgerow trees also furnish a suitable shelter for cattle and crops. In exposed situations, more especially, protection is required from the keen winds which blow in certain directions at particular seasons of the year, or from those sudden and severe storms that not unfrequently occur in our variable climate, and it is found that such trees afford protection in a very eminent degree, by their yielding so far to the fury of the blast, and thus breaking its force. They are alike beneficial as a grateful shade under which cattle may be sheltered from the heat of the sun in warm weather; and when, in addition to such advantages, their highly ornamental character is taken into consideration, their claim to our attention presents itself in a strong light. Nor must it be forgotten that they are also valuable on account of their timber; but where planted only for ornamental purposes, this latter consideration is not always to be estimated as an element of special utility. In practice, however, where the choice may be divided simply between appearance and profit, such a selection can be made from the numerous varieties now at command as will enable the forester easily to combine both of these objects together, at least to a considerable extent.

In the planting of hedgerow trees, therefore, let it be considered what they may be forty or fifty years hence—their size, form, and colour of foliage, and the effect which their appearance will then produce on the landscape—their use as regards shelter, their money value, &c., and such varieties as will give the best results in all these respects ought to be selected.

Those sorts which are most suitable for growing together, and harmonise in shape, naturally present themselves first to our notice, and of this class I would beg to name for groups, first, the lime (*Tilia europæa*) and horse chestnut (*Æsculus Hippocastanum*). These two make excellent companions for this sort of planting, the lime having beautiful yellow tinted foliage in autumn, while the chestnut is of a brown colour. Both trees are of a fine habit, half pyramidal in form, and afford excellent shelter. As compared with some others, however, they fail as regards value of timber, but the loss in this respect is fully compensated by their magnificent appearance.

Second group—the ash (*Fraxinus excelsior*), the oak (*Quercus Robur*), and sycamore or plane tree (*Acer Pseudo-Platanus*). The trees of this group are majestic and bold-looking, but less pyramidal in form than those previously named, being more rounded and stiffer in appearance, giving abundant shelter, and forming noble specimens as they arrive at maturity;—the ash of a bright shining green decaying to yellow, the oak bright yellow turning

to brown in autumn, and the sycamore of a yellowish green to brown. They are valuable on account of their timber, and for this reason are preferable to some that might perhaps be considered more suitable for merely decorative purposes.

Third group—the Scotch elm (*Ulmus montana*), English elm (*U. campestris*), beech (*Fagus sylvatica*), and purple beech (*F. sylvatica purpurea*). These are all of the same habit of growth, and being wide-spread and rather scattered in their branches, require a good deal of room ; but where that is no object, they are most worthy of a place. They afford capital shelter, and the timber of the former always finds a ready market and brings a good price. Few trees can compare with the purple beech for beauty of foliage or as specimens, the common beech also having fine yellow decaying foliage in autumn, and the elm changing from dark green to brown.

Fourth group—the birch (*Betula alba*), black Italian poplar (*Populus monilifera*), Lombardy poplar (*P. fastigiata*), and Norway maple (*Acer platanoides*). These are all spiral-headed, and finely suited for each other, forming a very gay group indeed. The beautiful white bark and pendulous branches of the birch have a cheerful and lively appearance at all times ; the black Italian poplar, with its towering head and leaves always in motion, changing in autumn from a bright green to a pale yellow, is truly grand ; the Lombardy poplar, with its close-set cypress-like habit, is both attractive and conspicuous ; while the Norway maple is a tree of peculiar beauty, fine habit, and elegantly cut foliage, forming in autumn a splendid specimen—its yellow and purple leaves being retained on the tree for a considerable time render it perhaps one of the finest foliaged hardy trees we have. In this group there is little as regards money value in timber, but the trees give good shelter, and are suitable for ordinary half-moist soil.

The fifth group comprises the Huntingdon willow (*Salix alba*) and Abele poplar (*Populus alba*), two very large growing and spreading trees, and extremely suitable for damp situations. Owing to their light and spreading habit they are excellent for shelter, and have pretty silver-grey foliage, which contrasts favourably beside other trees less attractive in this respect. But they are what we may term gross feeders, their roots running to a great distance in search of nourishment, which ought to be kept in check by occasional pruning. Their timber is useful for a variety of purposes.

The varieties now to be named for the sixth group are much more dwarfish in size than those already enumerated, and may perhaps be considered as belonging more properly to the large shrub class than to the trees, but they seem to me to be really necessary in order to complete the arrangement above indicated. They are

—the laburnum (*Cytisus Laburnum*), English maple (*Acer campestre*), birdcherry (*Cerasus Padus*), scarlet thorn, *Cratægus Oxyacantha-punicea* and *flora plena*). In this group we have nothing of value as regards timber, nor is the shelter afforded by these trees of much consequence, but in point of beauty we have nothing like them. What is more lovely than the laburnum in June, with its golden ringlets waving in the breeze, or the scarlet thorn decked out in such gorgeous livery in May and June, while the lovely white blossom of the birdcherry in May completes a group of matchless beauty! And although the English maple may be less brilliant in colour than the others, it appears to me to be most appropriate and necessary to this group, and makes a fine stubby tree, growing from 20 to 30 feet high, with neat and finely cut small leaves. These varieties are particularly adapted for lawn and roadside hedge planting; and for the latter purpose, with a few of the others intermixed, would make a continuous avenue of surpassing loveliness, while their introduction would be a decided improvement on the prevalent system, which presents the dull monotony of the oak, the ash, and the beech, and that whether they are in keeping or the reverse.

In finishing this list, I am aware that other varieties might have been added, but perhaps sufficient have been noticed for practical purposes; and if, at planting, the size and shape of the tree when arrived at maturity be kept in view, and a judicious arrangement chosen so as to suit the locality, we can seldom go wrong.

Let us suppose a hedgerow of trees to be planted, the hedge being at the outskirts of the lawn, and in full view of the mansion house. Let the standard or permanent trees be placed, say from 30 to 40 feet apart, and let these be the oak, lime, horse chestnut, purple beech, and sycamore. Fill in between each of these one of the following, namely, laburnum, birdcherry, and scarlet thorn, which will form a fine line of flower and foliage, and reduce the space to 15 or 20 feet apart. By trimming the trunks of the standards to a reasonable height, room will be made for their smaller companions for many years; and in course of time, when the standards have perfected their growth, the others could be cut out, or kept so low by pruning, that the one would in no way interfere with the other. Of course the selection could be greatly diversified from the above according to taste.

With reference to the treatment of trees for hedgerows in the early stages of their growth, it is now generally considered to be most convenient to procure them from the nursery suitable for the purpose at once, and in that case they should average from 6 to 10 feet in height, and be clean, well-grown plants. But if a smaller size be preferred, to be nursed at home for a time, let

them be from 2 to 3 feet in height, and plant out in nursery rows 2 feet apart, and 1 foot plant from plant in the row. Let them stand thus for two years, care being taken meantime to shorten all the side shoots of gross growth, and to keep the ground clean, &c. After remaining in this way for the time mentioned, they should then be lifted about the month of March, and neatly pruned, all straggling roots being cut back, which will cause the plants to throw out more fibres, and so materially assist in the growth of the tree. As the several varieties prosper, let them have sufficient room, by sizing them carefully, and planting again in nursery rows, this time giving 3 feet between the rows, and the plants 2 feet or even 3 feet apart in the row, if ground be no object. But the distance either way can be easily regulated by the size of the trees; contact with each other ought to be avoided, and room afforded for other two years' growth. And in such matters circumstances are a much better guide than mathematical precision as to feet and inches, for of course the larger trees require more space than the smaller.

In four years, and with the treatment above described, the trees ought to be in capital condition for finally planting out; and before being lifted for this purpose, pits should be dug for their reception, of about 3 feet in diameter on an average, which will allow plenty of room to get the roots properly laid in and equally adjusted. Pack the earth pretty firmly amongst the roots, which should be covered all over about an inch, then drive in three stakes at right angles round the roots, leaving about 2 inches of these above the surface of the earth covering the roots. Get three pieces of ordinary railing and nail to the stakes, keeping the railing pretty firm on the top of the roots; and when this is done, fill in the remainder of the earth, which will cover all up, leaving no appearance of staking. This method will save a vast deal of trouble in time coming, being much more effective than the ordinary staking, as it holds the tree firmer, while at the same time the stakes are put out of sight and cause no obstruction. Should the soil be of a stiff or clayey nature, some good common soil should be procured to plant with, that the trees may have a fair chance at starting.

As a rule, in lining off where the trees are to stand, I would prefer to place them about 2 feet in front of the hedge, rather than in the line of hedge itself, and for the reason, that when they are put in line and become of some size, they are apt to make gaps and spoil the appearance and usefulness of the fence. But by being planted in the manner proposed, these objections are obviated, and the fence preserved in the best possible condition.

All being finished in the manner above stated, there remains

only the duty of pruning from time to time. Hedgerow trees ought to have more care bestowed upon them than is generally given. Trees standing singly are much more exposed to the high winds and storm than when growing together in an ordinary plantation, and our care should be to supply them with all the power of resistance possible. This can be done to a great degree by judicious pruning, which leaves the least extent of surface to be acted upon by the force of the blast, and at the same time gives the tree the power of expending what of its natural energy it can bestow in strengthening its roots. First, then, never allow straggling branches to remain; and, secondly, never cut these clean off, but shorten them so as to give a proper balancing power to the tree. Allow the top free scope, but shorten all the other branches when and where necessary. If these simple directions are attended to, the result will be a fine, stubby, firm-knit tree, possessing the power of resisting almost any storm. Clean off the lower branches from time to time until you clear the top of the hedge, and ultimately have a clean trim of 10 or even 12 feet in height,—at all events, considerably above the height of the hedge, giving a free circulation of air to pass under the trees.

In conclusion, I am aware that nothing positively new has been advanced in the above statements, but my aim has been to present practical views in as plain a form as possible. The subject is a most important one, and if the observations now made may be the means of directing and securing more attention to it than has hitherto been given, so that such decorative planting may become more general, and the means for carrying it on effectively come to be better understood, I shall not have given these hints entirely in vain.

REPORT ON THE COMPARATIVE PRODUCTIVENESS OF TURNIPS.

By Hary Shaw, Bogfern, Tarland.

[*Premium—The Gold Medal.*]

In conducting agricultural experiments many obstacles often occur; but in the following trial the writer had the good fortune to meet with no difficulties. The field upon which the experiment was made is about 16 imperial acres in extent, of a southern exposure, 28 miles inland, and about 680 or 700 feet above the sea. The farm or field is on the six-course shift, three years pastured in grass; 1865, in oats after grass; in 1866, turnips. The field was furrow-drained in 1852, according to the government system;—drains 4 feet deep, 27 feet apart, filled with broken stones. The soil of the field is of light loam, darkish in colour,

better adapted for grass and turnips than for cereals; the subsoil is strong brownish clay. The field was deep ploughed in November 1865, and required no more ploughing; but in the month of May was brought into a very fine mould by the grubber and harrow. It is about 300 yards long, and about 250 yards broad. The centre was selected for the different plots. Each plot contained four drills, each drill 27 inches wide, which made 3 yards in breadth to each plot, and 201⅔ yards in length made ⅛th of an imperial acre. These were the extent of plots weighed; and the other 100 yards in length were to remain in the field during the whole of winter, to ascertain their hardiness or keeping qualities through atmospheric influence. These 100 yards at the end of the field, exclusive of the ⅛th of an acre, received the same quantity of manures and attention as ⅛th of the acre did, only that they were never weighed. Into each plot, or ⅛th of an acre, was put 2½ yards of equal made farmyard dung, with 28 lbs. of dissolved bones. The plots of swedes received 2½ yards of dung of the same kind as the others, with 56 lbs. of dissolved bones. The plots were sown at the different times stated in the table. The frost in the last week of May and the first week of June kept the swedes back a little, and gave them the appearance, at one time, of going off; the other kinds, not being so early sown, did not suffer from the frost. About the 20th of June they all showed a healthy appearance, and proved that the seed was all wholesome and free from damage; no turnip fly was visible on all the field. At the date of thinning they appeared equal in progress, and none of them showing any indication of decay. All the different kinds of seed were purchased from Benjamin Reid and Co., seedsmen, 132 Union Street, Aberdeen, with the exception of the plot of Old Meldrum seed. The seeds from the Messrs Reid were all very true to their kind,—so much so, that it was difficult to find one turnip in the plot that was not of the same kind. The Old Meldrum was the only plot in all the sixteen that was not altogether true to their kind.

The writer not being skilled in agricultural chemistry, is unable to describe properly the different feeding qualities of the turnips, but it is right that there be given a description of the different kinds, as far as known. It will be observed by the table, that although the swedes were first sown on the west side of the field, the white, or globes, were the first weighed, and, consequently, first on the table.

1*st*, The White Globe is not of a very regular shape, but comes very fast forward to maturity. It is sometimes called the Norfolk Globe; is soft, and easy cut by calves for the first time.

2*d*, Tankard white Globe grows far above the ground, much exposed to frost and all kinds of rough weather. It is a very

peculiar shaped turnip. Young cattle are very fond of it in October and November, but it is scarcely of any use if allowed to remain in the ground till April.

3*d*, The Pomeranian Globe.—A beautiful, well-shaped turnip. It grows to a very large size, is more hardy, and stands the winter better than the two preceding kinds. It is the greatest crop in weight of all the plots.

4*th*, The Greystone Globe, lately introduced into this district. —It is a large growing, profitable turnip, something like a cross between the Red-top Globe and the Pomeranian.

5*th*, Red-top Globe.—It is the hardiest of all the preceding sorts, and stands the frost far better than the rest of the globes,— a good, well-shaped turnip, with small neck and not much shaw.

6*th*, Early Bullock Yellow.—A very quick-growing turnip. It comes more quickly to maturity than any of the other yellows; would make a good substitute for second sowing when required by the turnip fly. Not so well shaped as some of the rest, but very solid, considering the rapid growth.

7*th*, Aberdeen Yellow.—An old-fashioned, useful turnip, celebrated as the staple turnip of Aberdeenshire for its hardiness and nutritious qualities; very profitable for feeding.

8*th*, Dale's Hybrid Yellow.—Rather a lightish yellow colour; seems a cross between the whites and the yellows; would not suppose it a good feeding turnip. It is an oblong-shaped turnip, not very hardy.

9*th*, Old Meldrum Turnip.—This is a yellow turnip, selected about the village of Old Meldrum, in Aberdeenshire. It is a large, well-shaped, globular turnip, particularly selected in shape, but not so good in quality or colour. As stated before, there are different kinds among this sort, such as the golden yellow and the Aberdeen early yellow. It is a little lighter in the colour than plots 6th and 7th.

10*th*, Tweeddale Purple-top Yellow.—This is a very hard, good turnip, much resembling the swedes; stands the winter well; is not of very large size, but grows low among the earth.

11*th*. Aberdeen Purple-top, much resembling the Tweeddale, but not so well shaped, and grows more above the ground.

12*th*, Bangholm Swede.—This is a purple-topped, well-shaped, hardy swede, but never grown here before; said to be much used in the south of Scotland.

13*th*, Bronze, or Kinaldie Swede.—This swede has a bronze coloured top, of a globular shape, very hard, with a deep yellow colour when cut open.

14*th*, Sheppard's Golden Swede, with green-top.—This is one of the best swedes cultivated in this part of the country for shape, bulk, and solidity; but it is rather larger in the neck bends than some of the other swedes.

15*th*, Skirving's improved Swede, with purple-top.—A large growing, profitable swede, and is the hardiest of all the class, and stands the winter frost best of all.

16*th*, Skirving's King of the Swedes.—This resembles plot 15 very much, but is more globe-shaped, with a deep yellow colour when cut up, and with a very small neck. It keeps low in the ground.

On the 16th April all the kinds that stood the winter were pulled and cut through the centre, to ascertain what effect the winter had upon them comparatively, which is stated in the last column of the table. The past winter the turnip crops have been curiously preserved from frost. In the month of January the frost was very hard. The turnips were all covered with a great depth of snow, and were not exposed to frost at all. February was fresh and mild, and March was again frosty; but the turnips were covered with snow the same as in January, so that the frost has done little harm to them this season. It was visible that all the globes were of little use at the date mentioned above; but by cutting them through the centre I was enabled to find how far they were gone in decay, and it was evidently proved to me that no globe turnips should remain in the field exposed to the influence of the weather, after January, at this altitude. The yellows stood the winter very well. When cut up through the centre there were some of them rather dry, the juice or liquid substance having gone off, Dale's hybrid yellow containing an empty space in the centre. The Old-Meldrums were very soft and spongy, containing little of a feeding quality. The Tweeddale purple-top and the Aberdeen purple-top appeared to be not affected at all by the winter, and scarcely a dry centre could be found. They are a very hardy turnip, well adapted for this altitude, and might stand as a substitute for swedes. The swedes stood the winter very well, and, after being cut up, no damage of any kind appeared among them, with the exception of the Bangholm swede. In the interior of it a decomposition was going on of round spots of different sizes, some one-half inch, others as large as 3 inches diameter. These spots of corruption were not confined to the centre, but were promiscuously through the whole turnip; but none of these spots appeared on the outside. Had I not opened up the turnips I might likely never have discovered this strange process of decay. In concluding my remarks on these experiments, which are only an extension of former trials, I am satisfied that the common white globes, the tankard globe, Dale's hybrid yellow, and the Bangholm swede, can no longer be raised here with advantage and profit for feeding purposes; and as all agriculturists are deeply interested, and self-interested, in the green crop husbandry, no stone should be left unturned to ascertain what *is* and what *is not* a profitable crop.

TABLE.

Names of the different kinds of Turnips experimented upon.	Date of Sowing.	Date of Thinning.	Date of Weighing.	Width of Drills.	No. of Turnips in 10 Lineal Yards.	Extent of Plot in square Yards.	Quantity of Manure to each Plot.		Cost of Manure for each Plot.*		No. of lbs. in each Plot.	Cost of Manure for each Ton of Turnips.	
							Dung.	D. Bones.					
White Turnips.				Inches.			Yards.	lbs.	*s.*	*d.*		*s.*	*d.*
1. Common white globes, . . .	June 13	July 3	Dec. 6	27	43	605	2½	28	11	4½	7215	3	6¼
2. Tankard globes, ...	,, 13	,, 3	,, 6	27	46	605	2½	28	11	4½	6870	3	8½
3. Pomeranian white globes, . .	,, 13	,, 3	,, 7	27	41	605	2½	28	11	4½	7282	3	5¾
4. Greystone globes, ...	,, 13	,, 3	,, 7	27	47	605	2½	28	11	4½	7273	3	6
5. Red-top globes, ...	,, 13	,, 3	,, 8	27	44	605	2½	28	11	4½	7067	3	7¼
Yellow Turnips.													
6. Early bullock yellow, . . .	June 5	June 28	Dec. 11	27	42	605	2½	28	11	4½	6656	3	9¾
7. Aberdeen bullock yellow, . .	,, 5	,, 28	,, 11	27	45	605	2½	28	11	4½	6469	3	11¼
8. Dale's hybrid yellow, . . .	,, 5	,, 28	,, 11	27	46	605	2½	28	11	4½	6255	4	0¾
9. Old Meldrum yellow, . . .	,, 5	,, 28	,, 12	27	48	605	2½	28	11	4½	6770	3	8¾
10. Tweeddale purple-top yellow,	,, 5	,, 28	,, 12	27	41	605	2½	28	11	4½	5911	4	3½
11. Aberdeen purple-top yellow, .	,, 5	,, 28	,, 12	27	43	605	2½	28	11	4½	6100	4	2
Swedes.													
12. Bangholm swede, ...	May 17	June 26	Dec. 20	27	49	605	2½	56	13	4½	5575	5	4½
13. Bronze or Kinaldie's swede, .	,, 17	,, 26	,, 20	27	47	605	2½	56	13	4½	5520	5	5¼
14. Shepherd's swede, ...	,, 17	,, 26	,, 20	27	43	605	2½	56	13	4½	5980	5	1¾
15. Skirving's improved swede, .	,, 17	,, 26	,, 21	27	46	605	2½	56	13	4½	5693	5	3
16. Skirving's king of the swedes,	,, 17	,, 26	,, 21	27	48	605	2½	56	13	4½	5531	5	5

* Dung, 9s. 4½d. ; Dissolved bones, 2s. = 11s. 4½d. : 2s. additional for Swedes, = 13s. 4½d.

Name of the different kinds of Turnips experimented upon.	Result per Imperial Acre.																		
	Weight of Crop of Turnips per Imperial Acre.				Value of Turnips per Acre.*			Cost of Manure per Acre.†			Deduct the Cost of Manure.			Relative Position for Value.	Relative Position for Weight.	Relative Position for Atmospheric Influence during Winter.
	Tn.	cwt.	qr.	lbs.	£	s.	d.	£	s.	d.	£	s.	d.			
White Turnips.																
1. Common white globes,	25	15	1	12	7	1	8½	4	11	0	2	10	8½	14th	3d	15th
2. Tankard globes,	24	10	2	24	6	15	0¼	4	11	0	2	4	0¼	16th	5th	16th
3. Pomeranian white globes,	26	0	0	16	7	2	11¾	4	11	0	2	11	11¾	12th	1st	14th
4. Greystone globes,	25	19	2	0	7	2	10½	4	11	0	2	11	10½	13th	2d	13th
5. Red-top globes,	25	4	3	4	6	18	9¾	4	11	0	2	7	9¾	15th	4th	12th
Yellow Turnips.																
6. Early bullock yellow,	23	15	1	20	8	17	10½	4	11	0	4	6	10½	3d	7th	8th
7. Aberdeen bullock yellow,	23	2	0	8	8	13	3¼	4	11	0	4	2	3¼	5th	8th	9th
8. Dale's hybrid yellow,	22	6	3	4	8	7	6½	4	11	0	3	16	6½	9th	9th	10th
9. Old Meldrum yellow,	24	3	2	8	9	1	4	4	11	0	4	10	4	2d	6th	11th
10. Tweeddale purple-top yellow,	21	2	0	24	7	18	3¾	4	11	0	3	7	3¾	11th	12th	6th
11. Aberdeen purple-top yellow,	21	15	2	24	8	3	5	4	11	0	3	12	5	10th	10th	7th
Swedes.																
12. Bangholm swede,	19	18	0	24	9	9	1¾	5	7	0	4	2	1¾	6th	14th	5th
13. Bronze or Kinaldie's swede,	19	14	1	4	9	7	3¼	5	7	0	4	0	3¼	8th	16th	3d
14. Shepherd's swede,	21	7	0	16	10	2	10½	5	7	0	4	15	10½	1st	11th	4th
15. Skirving's improved swede,	20	6	2	16	9	13	1¾	5	7	0	4	6	1¾	4th	13th	1st
16. Skirving's king of the swedes,	19	15	0	8	9	7	7¾	5	7	0	4	0	7¾	7th	15th	2d

* White at 5s. 6d. per ton; Yellow, 7s. 6d. per ton; Swedes, 9s. 6d. per ton.
† Dung, 20 yards, £3, 15s.; Dissolved bones, 16s. = £4, 11s.; 16s. additional for Swedes, = £5, 7s.

REPORT OF EXPERIMENT ON OATS.

By William Walker, Ardhuncart, Mossat, Aberdeenshire.

[*Premium—Five Sovereigns.*]

The object I had in view in this report was to endeavour to ascertain, by a carefully conducted experiment with two different manures, part mixed and part unmixed, for crop 1865, which would produce the best results at the least cost. I occupy a considerable extent of high-lying land, which, when broke up from three years' grass (the rotation I am bound to), will scarcely return the expense of seed and labour without a top-dressing of some kind or other.

It then becomes an absolute necessity to ascertain, if possible, the most economical mode of treating such land.

I therefore resolved to conduct an experiment for the purpose on the size of plots recommended by Professor Anderson, chemist to the Highland Society—namely, $\frac{1}{112}$th of an acre, which, from past experience of the unwieldy working of large plots, I highly approve of in general. 1 lb. per plot giving 112 per acre.

Coprolites and sulphate of ammonia were the two manures used, all done in duplicate except two. The manure was all sown and harrowed in with the seed. I regretted afterwards that I did not try a plot with ammonia on the surface after it was brairded.

The average results of analysis of the coprolites treated with sulphuric acid are as follows:—

Moisture, ...	4·50
Sand, ...	12·50
Carbon, ...	2·50
Phosphate, Tribusic, ...	76·00
Carbonate of Lime, . . .	4·58
	100·00

The sulphate of ammonia about 25 per cent. actual ammonia.

The manures for the different plots were carefully weighed, mixed, and broken. The land may be termed poor outfield, about 700 feet above the level of the sea, soil about 6 inches deep, subsoil coarse gravelly clay—naturally dry, and almost level. The plots were carefully measured off, small elastic pins put in at the corner of each plot; a space of six inches was left between each plot one way. As I had every reason to believe that the crop would not lodge, and the pins would remain all the season in their proper places, furnishing a sufficient guide, in-

stead of galvanised wire being stretched between each plot, at harvest time I stretched a rope between till one plot was cut, then shifted the rope to the other, and so on. Of course, this plan would not answer if the crop was lodged.

The oats and manure were sown on the 20th of April. The quantity of manure applied to each plot is stated in the table, and the quantity of grain sown 3½ bushels of Scotch birley oats per acre, drilled 5 inches apart. The experiment had every advantage as regarded the sowing of the manure, being a nice calm day, and the land otherwise in the best order possible for receiving the seed. There was no difference that I could perceive in the brairding of the different plots; but further on in the season, and during the severe heat and drought, the plots containing sulphate of ammonia appeared greener than the rest, and had a more bulky appearance all through. The season being so adverse I paid less attention to the progress of the different plots than I usually do in conducting experiments. All the plots were cut on the 7th of September, carried and weighed on the 15th, thrashed and dressed on the 16th; dressed grain deducted from the gross produce.

I may mention, that all the work connected with the experiment was done with my own hands. The only difficulty I found was in the thrashing and weighing. My steelyard I did not consider suitable for such small quantities, and the thrashing-machine is too large for the same reason. I had to cart the whole a considerable distance to a crofter's barn, who had a light thrashing-machine driven by hand, and by laying a sheet in below to receive the grain of each plot I got it done then to my entire satisfaction. All the nothing plots seemed so very equal that I did not consider it necessary to weigh more than one plot.

The plan adopted previous to carrying was, that I had each plot tightly bound up and numbered, the weight of each ascertained with a common balance; the grain belonging to each plot, when thrashed, was put into a bag with its number attached, then taken home and dressed, which completed the process.

Perhaps it might be partly owing to the adverse season that the applications have, with the exception of one case, proved to be a loss. The nature of the season has always so much to do with experiments that we can never draw any practical information, unless from the results of two or three years. The manure is put down in the table at what it cost at the nearest railway station.

TABLE SHOWING THE RESULTS OF THE EXPERIMENT ON THE OAT CROP 1865.

No.	Kind and Quantity of Manure applied per 1-112th of an imperial acre.	Gross Weight per 1-112th of an acre.	Straw per 1-112th of an acre.	Dressed Grain per 1-112th of an acre.	Cost of Manure per imperial acre.	Dressed Grain per imperial acre.—38 lbs. per bushel.	Value of Oats and Straw at £2 per quarter.	Showing Profit and Loss on Average of Duplicate Plots compared with Nothing.
		lb.	lb.	lb.	£ s. d.	Q. b. lb.	£ s. d.	s. d.
1	Nothing, . . .	20	12	8		2 7 22	5 17 9	
2	3 lbs. of coprolites, .	26	16	9	0 19 6	3 2 20	6 12 6	Loss 12 3
3	Do., . .	22½	14	8½	0 19 6	3 1 2	6 5 3	
4	6 lbs. of coprolites, .	31½	21	10½	1 19 0	3 6 36	7 14 6	Loss 4 6
5	Do., . . .	32	21½	10½	1 19 0	3 6 36	7 14 6	
6	3 lbs. of coprolites and 1 lb. of sulphate of ammonia,	36	25	11	1 17 6	4 0 16	8 2 0	Loss 4 0
7	Do., . . .	36	25½	10½	1 17 6	3 6 36	7 14 6	
8	6 lbs. of coprolites and 1 lb. of sulphate of ammonia,	43	28½	14½	2 17 0	5 2 28	10 13 6	Profit 15 0
9	Do., . .	40	26½	13½	2 17 0	4 7 30	9 18 9	
10	1 lb. of sulphate of ammonia, .	28	19½	8½	0 18 0	3 1 2	6 5 3	Loss 10 6
11	1½ lb. of sulphate of ammonia, .	34½	25	9½	1 7 0	3 4 0	7 0 0	Loss 4 9

REPORT ON THE MANAGEMENT AND VALUE OF POPLAR.

By C. Y. MICHIE, Forester, Cullen House, Cullen.

[*Premium—Five Sovereigns.*]

No person forty or even twenty years ago could well have foreseen or predicted the present demand for, and consumption of poplar wood, because one of the principal appliances of it had not then been called into full and active operation, by the great and important changes that have since taken place in the formation of railways throughout Great Britain, which, during the latter period, have been increasing at the rate of about 650 miles annually. In 1860 it was estimated that about 10,000 miles of railway were in working operation throughout this country, or, taking into account the double and often treble lines at stations, amounting to 3000, and reducing all such lines to single ones, the total extent of single line of railway would be about 18,000 miles. Some idea may be formed of the vast consumption of poplar, alder, willow, and lime-tree, for break-blocks alone, from the fact, that even on the Highland Railway and its branches, the single line of railway, including the double lines at stations between Perth and

Inverness, amounting to 275¼ miles, consumes annually about 5000 break-blocks, equal to about 2500 cubic feet of square wood. If, therefore, 275¼ miles of railway require annually 2500 feet of square wood, the 18,000 miles throughout the whole kingdom must require 163,488 cubic feet. Poplar being the best kind of wood for the above purpose, it would doubtless be so employed, if it could be procured, which at present it cannot.

During the last twenty years quite a change has taken place in the value of the various kinds of wood. Oak timber, formerly of the highest value, and in the greatest demand, has considerably declined in price, even the best descriptions of it, such as ships are built of; while those kinds of wood, once almost valueless, have risen to more than double their former price,—such as poplar, alder, willow, &c.,—and seem likely to maintain, if not exceed, their present price, unless an equally good and cheaper article can be found as a substitute for them. If, as suggested by the Highland and Agricultural Society of Scotland, poplar could be grown upon ground which will not grow larch, and prices equal to what the former commands can be obtained for it, the demand and consumption continuing at the rate above indicated, then undoubtedly all that the society anticipates, in point of profit, from its cultivation, would be fully realised.

That poplar timber, as an article of produce, is one of the most remunerative that the soil in many cases is capable of yielding, will appear in the sequel of this paper; while, at the same time, upon certain descriptions of soil it has the advantage over most other crops in early beautifying and adorning the landscape. Within a very few years after it is planted, it is valuable to cut; and, indeed, it can be turned to profit at every stage of its growth. The maturing of the heart-wood is of no consideration, the sapwood being equally durable. Nor is it necessary, in order to its profitableness, to grow the poplar to a great size, even were the ground capable of doing so. Two trees containing 50 feet each are more profitable to the grower and purchaser than one tree containing 100 feet. The number of species of the poplar family is variously estimated by different writers at from sixteen to twenty-four, and the varieties belonging to each are numerous and interesting. Of the above, four are indigenous to Britain; the others have been introduced from foreign countries, principally North America and Russia. Of those species esteemed valuable as timber trees, and adapted to the soil and climate of Scotland, may be mentioned:—

First, The Aspen—Rattler or Quaker (*Populus tremula*). It grows wild in many districts all over the country, sometimes springing up in damp places, and sometimes on dry gravelly hillocks. In all cases it appears to prefer nature and wildness to art and cultivation. It grows more abundantly in the High-

lands than in the Lowlands. In the latter it is rarely found except when planted by the hand of man; in the former the hand of nature scatters it profusely. Notwithstanding its rich, attractive, and inviting foliage—its dark reddish brown suckers, like the oak—its leaves roundish and angular, smooth on both surfaces, green above and whitish below,—no animals, such as sheep, cattle, or horses, will eat of it, owing, probably, to its bitter taste. It is venerated by many of the old inhabitants of the North of Scotland, who regard it with superstition and awe, on account of an opinion obtaining that it is the tree out of which was made the cross of our Redeemer—the agitation of its trembling leaves being a perpetual protestation against its application to so awful a purpose.

The foliage of the aspen is beautiful at all stages of its growth—when young, middle aged, or old—its ceaseless motion ever displaying its variegated colours. It has a great tendency to exhaust the soil and absorb moisture. Its numerous suckers, wherever its roots spread, render it sometimes objectionable on that account. Its recommendations as a timber tree are its hardiness, its leaves standing exposure to high, boisterous winds, and even sea-air. It grows to a good size in places where even the birch is stinted and dwarfed through poorness of soil, continues healthy, and retains a rich, fresh foliage in maritime districts, where all other trees are blasted and withered. Its timber, though rarely of large dimensions, is pure white, soft and smooth when dressed, makes excellent vessels, as pails, cogs, and soles of wooden shoes. It is also well adapted for staves and break-blocks for railway waggons; as paling, it lasts longer than the sap-wood of pine, makes excellent palisades, and is well adapted for splitting into plaster lath. The aspen bears pruning badly, especially the cutting off of large branches. It is liable, also, to the attacks of a large white grub, which eats into its heart-wood, and when old it is subject to ground-rot. To grow it large, a deep, dry, sandy loam is required in an exposed situation. The main object, however, in cultivating it is to shelter more tender trees, by planting it upon the poorest soil and most exposed situation, or near streams, lakes, waterfalls, or rocks, with a view to ornamental effect.

Second, A species of poplar, indigenous to Great Britain and most parts of Europe, is the White Poplar (*Populus alba*), which, though frequently grown from cuttings and suckers, is most commonly and most advantageously raised from layers. This is accomplished by bending down pliant shoots, and fastening them to the ground by means of hooked pegs. The shoots on being bent into the ground are partially cut with a knife at the part deepest embedded in the earth, thereby inducing them more readily to strike root. Plants grown from layers are sooner raised

to large-sized trees than those grown from seed, or even from cuttings. The process of laying is best done in March, and the young shoots should be separated from the parent stock after remaining one year attached. They are then transplanted into rows in the nursery ground, where they remain at pleasure, sometimes one year, sometimes two or three. This is a tree of rapid growth in a moist situation, and in a rich soil it attains a large size, often exceeding 100 feet in height, and containing an equal number of cubic feet. It changes its character very much at various stages of growth. Its young shoots and small branches have a purplish bark, and the leaves of the young plants are covered with a thick coating of white down underneath. In proportion as the tree grows older the down becomes less and less apparent. It is an object of general admiration, its majestic appearance attracting the attention of the beholder. Its branches, though not large, are bold, sweeping, and regular. Its leaves, when young, are large, resembling those of the herb coltsfoot, and yield an agreeable scent. No species of the poplar family changes its form and foliage so greatly as the *Populus alba* as regards the size and shape of its leaf, which often causes it to be mistaken for another species. It has a great tendency to produce suckers, which spring up, not like those of other trees near the trunk, but at every place where the roots extend, to the very extremity of the fibres. The timber is superior in quality to that of the aspen, and is also less liable to ground-rot and the attacks of the white grub previously mentioned. As paling or weather-boarding it lasts as long as spruce, while for flooring it is equal to Scotch pine, and is eagerly sought after for break-blocks and staves for barrels.

Third, The Gray Poplar (*Populus canescens*), like the aspen and white poplars, grows in many parts of Great Britain. It generally springs up on the margins of wet but good ground. The writer has often seen it growing in a natural state upon banks overhanging boggy ground. It attains a size equal to that of the white poplar, when they are grown together upon good soil, and surpasses it in growth upon poor ground. The gray very much resembles the white poplar, and a common observer is very apt to mistake the one for the other. The stigmas in the former are eight in number, in the latter only four. The leaves in the white poplar are also more round and less cut and lobed than those of the gray. This is a very hardy tree, and grows well even on indifferent soil. Unlike the other species, it is little liable to produce suckers, and seldom attains a very great size.

Fourth, The Black Poplar (*Populus nigra*) grows wild in many districts of Scotland, as well as in most parts of Europe and north of Africa, and may, therefore, be properly regarded as indigenous to this country. Its natural habitat seems to be a moist situa-

tion. Its leaves are pointed, serrated, of a pleasant lightish green colour, and smooth on both sides. They are also smaller than those of the white or gray poplar, though, as in the others, this is not quite a reliable index. As a timber tree it attains in a few years large dimensions, soon arriving at a state of maturity, and as soon decaying if allowed to remain upon the ground. The wood is of a pale yellowish colour, soft and easily wrought, and equals in quality that of any other species of poplar. Its bark is useful for tanning, being for that purpose of nearly the same value as that of the larch, about £3 per ton. The black poplar has a tendency to produce suckers from its underground roots, though to a less extent than the Abele tree. It is generally propagated from cuttings, which strike root readily. It attains a size equal to that of the last named species.

Fifth, The Necklace-bearing or Black Italian Poplar (*Populus acladesca*) is said to have been introduced into Britain from Canada in 1772. It is grown from layers or cuttings, generally from the latter. It delights in a moist, deep, rich soil, and sheltered situation, and grows well upon moss. In America it is said to attain immense proportions, and even in Britain it grows to a very large size, often above 120 feet. No forest tree in this country grows to such a height in so short a time. As a timber tree in Scotland it is certainly the one which, during the planter's lifetime, would pay him best, as we shall endeavour to show. It takes precedence of all others of the poplar family, both with respect to its rapidity of growth, and its quality of timber. Its wood is of a grayish white colour, and, unlike many other kinds of timber, is as tough when seasoned as when green. It is applicable to all the purposes to which the wood of the preceding species is applied, and is more valuable than any of them.

Sixth, The smooth-leaved Ontario or Canadian Poplar (*Populus lævigata*) was introduced from North America in 1769. It grows to a good size in a short space of time when in rich, deep, cool, and rather damp soil, and in a sheltered situation. Its foliage is of a beautiful shining colour. Its timber in point of quality is not so good as that of the preceding species, where strength and durability are required, but for railway breaks it is equally valuable. The *Populus lævigata* is generally propagated from cuttings, though sometimes also from seed and layers. In Scotland it may be regarded only as a secondary timber tree.

Seventh, The Long-leaved Poplar (*Populus macrophylla*) was introduced into Britain from North America in 1820. It is a tree of very rapid growth, and when grown upon suitable soil attains a large size. It grows advantageously only on deep, rich loam, and in a sheltered situation. It is propagated from both cuttings and layers. Its wood is rather short grained, and is apt to split when dried. It is well adapted, however, for staves and

break-blocks. Like the variety mentioned immediately before, it is only regarded as a secondary timber tree in Scotland.

Eighth, The Ontario Poplar (*Populus candicans*) is another species from America, said to grow wild on the borders of Lake Ontario. It is of all the poplars first in flower and then in leaf, the latter being the largest of any species of poplar, and measuring when young often 8 inches in length. Its buds are gummy, and along with the foliage produce a strong balsamic smell. Its wood is soft and brittle, and only useful for a few industrial purposes. Like the other species it is propagated in various ways, chiefly from cuttings. It is too tender for general planting in Scotland, the soil being too poor to sustain it properly.

Ninth, The Balsam Poplar (*Populus balsamifera*) is a native of North America, introduced into Britain in 1700. It is a beautiful odoriferous tree, and, next to the Ontario, comes earliest into leaf, the soft sweetness of which delights the eye in early spring. As timber it is little valued, being employed only for break-blocks and staves. It is seldom planted with a view to profit.

Tenth, The Angular or Carolina Poplar (*Populus angulata*) was introduced from North America in 1738, where it is said to attain the height of 150 feet. A rich dry soil and sheltered situation are requisite to insure its growth in this country. Much dead wood is found on it, indicating decay in the root. Though its timber is only of a secondary class, it deserves to be planted for variety and beauty. The preceding list of poplars, embracing ten varieties, includes those of most importance to the cultivator, whether regarded as timber trees or trees of ornament. We offer now a few remarks as to their culture and general management.

Sufficient room, yet not too much, is one of the chief requirements of the culture of poplar. Care must be taken to relieve the tree of a superfluity of branches and contending shoots, by timeously pinching them off during early summer, which answers all the requirements of pruning without inflicting the evils resulting therefrom. It being rather the exception than the rule for foresters to propagate their own plants wholly, purchasing them from nurserymen when two or three years old, the writer will state his experience in this matter. As the ground best adapted to grow poplar is such as produces rough grasses and coarse herbage, which is, however, apt to choke the youthful plant, the best method in such a case is to plant trees of such a size as to be at once above the herbage, and in order to do this at as moderate a cost as possible, the writer would place the plants purchased into rows, either in a home nursery, or the corner of a field, whence they could be removed to their permanent situation at the least expense. The ground selected as a temporary nursery for only one year requires little preparation beyond digging and

cleaning, and enclosing with hurdles or flakes, which are easily removed and erected at small cost. The writer has found it necessary also to employ wire netting, that is, when hares and rabbits abound. To save manual labour the ground may be prepared by ploughing, grubbing, and harrowing, which is more expeditious than spade culture.

The writer has found it a great advantage to be able to transplant the young trees from the nursery to the forest with earth adhering to them. To accomplish this as fully as possible, it is well to employ a box, 3 feet long by $2\frac{1}{2}$ wide, and 2 feet deep, which is fixed between two handles in the form of a hand-barrow, well rounded at the edges to prevent friction and injury to the bark of the trees placed in it to be carried to the site of planting.

On purchasing the plants from nurseries, or raising them at home, the following conditions are worthy of being observed:—

1*st*, The plants should be grown upon a sandy or light loamy soil—never upon clay or wet ground.

2*d*, The soil should not be recently or richly manured, which is apt to force the plants into a luxuriant top growth, but should have produced at least one crop of cereals between the period of manuring and that of cropping with poplar.

3*d*, The plants should not stand more than two years in the rows where first planted as cuttings or layers, and should be lifted and transplanted each year afterwards till the time of finally planting them in the forest ground.

4*th*, The situations, both of the permanent and temporary nurseries, should be such as are well exposed to the action of the elements, because if plants are not inured to them in the nursery ground, how are they able to stand them when removed? These precautions, therefore, are by no means unimportant, and ought not to be overlooked.

A question is often asked, Which are the best sorts of poplar for cultivation in this country? We answer, much depends upon the soil and situation. If the soil be of first-rate quality, and the situation favourable, I would plant black Italian poplar, profit being the sole object sought. On similar soil, but in a situation more exposed, I would plant black poplar, which is less liable to be broken with the wind than the former. Again, if an inferior quality of soil be taken, the subsoil wet, but situation sheltered, I would plant the white or woolly-leaved poplar. With similar soil, but exposed situation, I would plant the gray poplar, whose foliage and branches suffer less by wind than those of the white poplar. When the soil is very poor, and exposure greater than is suitable for any of the preceding species, I would plant the aspen poplar, the hardiest of them all. For profitable planting the fore-mentioned sorts would supply all

that is required, and pay the proprietor better than any other known species. For the sake of variety, however, or ornamental effect, the following kinds might also be added—the Canadian, the long-leaved, and the Ontario poplars. Indeed, the latter might in some instances be advantageously substituted for the former. For example, I would sometimes be inclined to substitute the Canadian poplar in place of the black Italian, the long-leaved in place of the black poplar, and the Ontario in place of the Abele tree. Even the balsam might be substituted with advantage in place of the gray poplar, and the angular or Carolina in place of the aspen.

The order of time in which the plants appear in leaf, disposition to produce suckers, comparative value of wood for outdoor as well as indoor purposes, diseases to which the various species are liable, sorts of soil to which each species is best adapted, &c., will be given in a tabular view at the close of this paper.

The following is the practice adopted by the writer in preparing the soil for receiving the plants so as to ensure the best crop, founded upon experience on a large scale. In planting black or black Italian poplar, the ground should be drained of superfluous water. Although the tree grows well, even luxuriates, in a rather wet soil, yet it does not live long on such, in consequence of decay of the root. Thus strong dry clay is preferable. Draining by means of four-feet tile drains, with one foot of small stones or gravel upon the tile, is the best plan. Such draining acts well, and evidently conduces to the growth of the tree in other respects than that of merely carrying off water. The writer has watched attentively for many years the difference in growth between trees grown upon tile-drained ground and trees grown amid open drains or undrained ground, and can vouch for the decided superiority of the former in point of growth. The superiority, however, is more apparent in one class of trees than in another. Those of the poplar tribe that benefit most by draining are the aspen, Lombardy, white Egyptian, and small-leaved white poplar. Those which thrive best in wet ground are the balsam, black Italian, large-leaved white and black poplars. Tile draining is, no doubt, sometimes objected to, on account of the roots entering and obstructing the water in the tiles. But by the time the roots of the trees have reached the bottom of a four-foot drain and choked it, the trees themselves will be so far advanced as to act both mechanically and chemically in ways conducive to the drainage of the ground. Mechanically, by the leverage power the trunk exercises over the roots during wind or storm, in breaking up, shaking, and pulverising the subsoil, thereby enabling the water to find its way to a depth where it cannot injure the roots; and chemically, by absorbing the water, drying the ground, and evaporating the

moisture through the leaves and other parts of the tree. The quantity of water thus carried off by trees in a healthy state is very great, and may be shown from the fact of ground which, while growing plantations, is perfectly dry, upon their being cut down becoming quite wet.

Another important operation in preparing ground for poplar is making the soil and subsoil as loose as possible, so as to allow the tender roots to spread freely. This is expeditiously and cheaply effected by the plough, a subsoil plough following an ordinary one in the same furrow, and breaking the subsoil without bringing it to the surface. I have seen ground so prepared at a cost of 20s. per acre. Ground, however, which cannot be so prepared requires other means—the cheapest and most efficient of which are, in the writer's experience, the borebill, a drawing of which, accompanied with description, is given in the Highland Society's Transactions for 1863, page 76. It is not necessary to loosen the soil to a depth over 18 inches, or to bring the subsoil to the surface, as is generally done in trenching; all that is required is, to render the soil free and open to such an extent as to enable the roots to go through it readily, till the trees are large enough to feel the force of the wind, after which they are enabled to prepare the soil for themselves, as it were, by shaking and pulverising it for their own development. The cost per 100 trees for thus preparing the ground is 6d., and the process has all the advantages of ploughing, or even trenching, or the common practice of pitting, without the expense or evils attending them. By the method of boring, a saving is effected over that of pitting at a rate of from 50 to 70 per cent. The advantages derived from loosening the soil might be illustrated by many cases which came under the writer's observation where larch and various other kinds of trees had failed to grow after repeated planting, until the soil was loosened and well broken, when the results were most satisfactory. Too great attention, therefore, cannot be paid by planters to loosening and opening the soil; and the poorer the soil the more necessary is this operation.

In planting trees of slow growth, however, loosening the soil is of less importance than in the case of rapidly growing ones, which unless so aided soon exhibit signs of stinted growth. Another consideration of vital importance is the state or health of the plant, particularly its roots. Plants grown on soil that renders their roots succulent, are not in a state fit for removal to the forest ground, especially if the soil is dry and hard, because the roots habituated to moisture are not in a state fit to derive nourishment from the drier ground. On the other hand, plants may be transferred with advantage from a dry to a moist situation. Sometimes a slight mixture of soils is beneficial. An example of this occurred under the

writer's superintendence, upon an estate in Roxburghshire, in 1859. In that he planted a great number of the various hardy species, including balsam poplar, Ontario, and Athenian, the soil being a stiff clay, and he was surprised to find that they all died soon after planting. White Egyptian, Lombardy, and Carolina lingered a little, but died also. The only plant that flourished was the black Italian. Finding the utmost difficulty in getting the latter to root, he adopted successfully the following plan. On forming the hole for receiving the plant, he made it deeper and wider than sufficient to admit the roots. This hole he partly filled with light earth, sufficient to cover the roots until they became incorporated with the native heavy clay. The plants thus treated succeeded perfectly well.

Another difficulty to contend with in planting poplar, is the wind which, by twisting and tangling them, injures and often destroys them. This arises from the top of the tree being heavy as compared with its root, and the latter not having depth or sufficient anchorage power to sustain the former. Caught in a heavy gale, for example, it is in danger of toppling over. Stakes are in such a case of great utility. When the number of trees is only small, they can easily be supported by this means ; but when it is great, say as many as to cover an acre, or about 600, of course the task is more difficult, and attended with expense. Stakes, at a moderate calculation, would cost 2d. each, including ropes and putting down, and supposing 600 trees were thus supported, the expense would be £5. This added to the cost of an acre of plantation is thus sunk during the period of growth, which, if 40 years, would amount to £20 alone—an item too considerable not to require looking into before adopted.

If, however, stakes can be dispensed with, so much the better. Of two trees planted, one with stakes and the other without, it is well known that the latter thrives best, which arises from its being freely shaken by the wind, which agitation proves so beneficial to the flow of sap and nourishment into every part of it.

Stakes are also attended with evil, occasioned by the breaking of the ropes or bands, or by these becoming too tight. In either case care is required to keep them in proper order. Particular attention must be paid, lest they injure the bark or leaves of the young trees by rubbing against them during high winds. To obviate the necessity of stakes, the writer has long adopted the following method, which is cheap, simple, and efficient. All trees planted with few roots, or without a ball of earth attached, when so high as to feel the force of the wind, are apt to be shaken and injured. Especially is this the case with regard to poplars which, from their very nature, are liable to suffer in this manner. Let the planter judge what proportion, in point of size,

the root bears to the top, and by means of a sharp, clean-cutting knife, reduce the latter within due proportions. This often saves the tree from the effect of the wind, and may be done without either injuring or disfiguring the tree, which in a short time, by new shoots, repairs its defects.

The methods of planting poplar are similar to those of planting other trees of the hardwood class, and need not be adverted to beyond what relates to the ground into which they are planted.

The writer superintended the planting of a field in the county of Sussex, performed as follows:—The field was prepared for planting after a recent crop of wheat, and ploughed and harrowed, which cost 15s. per acre. The operation of planting was commenced by stretching a line from top to bottom of the field, beginning at the east side, and removing the line and working backwards, so that the line, on removal to the next row, did not require lifting over the planted trees. In this instance the object of planting was a crop of wood for hop-poles, not for timber; but it serves to illustrate the method of planting for the latter object, the only difference between the two being the distance of the trees from each other—those planted for hop-poles being put in at 4 feet apart each way, those for timber being planted 8½ feet from each other.

Where profit is the sole object of planting, and the soil clayey, three rows of beans may be planted between the trees the first year, two rows of potatoes the second year, and two rows of turnips the third, after which, if the trees are vigorous, grass seeds may be sown, and the herbage cut with the scythe once or twice a-year. This latter treatment may continue till the plantation is eight years old, when it may be grazed during summer with Cheviot or Leicester sheep, care being taken to remove them before the pasture is eaten bare, as otherwise they might injure the trees.

Again, where ornament or beauty is the object sought, some conspicuous place should be selected for planting. The ground should be planted after a crop of turnips has been eaten off by sheep, and it has been ploughed, harrowed, and rendered smooth and even. Grass and clover seeds having been sown in it, the grass should be cut twice a-year, and carried out from amongst the trees in sheets.

Where quick growth is the primary object, it is best promoted by continuous hoeing and loosening of the earth amongst the roots of the trees, care being taken to use such implements as may not injure the roots, such as the steel grape and borebill.

Old lea or pasture land, where the turf is thick and matted, is frequently selected for planting. In this case the turf requires paring off around the space where the tree is planted, which

enables the invigorating elements to reach the roots. Soil very firm should be well loosened with the borebill. Rough herbage in every case must be kept clear of the young trees.

An important duty devolving on the planter, is that of keeping the earth clear of the neck or most vital part of the tree, where the stem and roots join, as the freer and looser these are the sap ascends the more copiously into and promotes the growth of the tree. In every branch of arboriculture the writer has remarked the advantage of attending to this. He was first led to notice this fact in the case of a row of trees which grew upon a turf dyke, which, on being levelled down, left all their largest roots exposed. On comparing the dark rich foliage of this row with that of another close by, whose roots were unexposed, the difference in favour of the former was so great as to excite the astonishment of every one to whom the circumstance was pointed out. By the practice of removing the earth and partly exposing the roots many sickly trees were restored to health, the growth of the healthy promoted, and especially in fast-growing trees, like the poplar, its beneficial effects were at once apparent.

To illustrate the above mode of treatment or management of poplar, we must enter more fully on the subject.

1*st*, Because of the natural hardiness of the poplar, it requires no other trees to shield or nurse it, and all such nurses would only retard its growth and development.

2*d*, The poplar being the fastest grower of all forest trees, especially in its early stages of growth, is well fitted to be a protection or nurse to other trees when they are young. The species to which it is best suited as nurse are oak and ash ; the reason of which is, that the latter grow well on clayey soil where there is moisture—not adapted for larch or spruce—and such as the poplar luxuriates in.

3*d*, For a crop of poplar exclusively the trees should be planted at a distance of from 8 to 9 feet apart, for the following reasons :—First, because no thinning is required before the trees are of a size fit for cutting, and because they pay best to remain at the distance planted till the whole is cleared as a crop ; and, secondly, because the natural habit of the poplar, unlike most other trees, is to take a rapid upward direction of growth, unaided by art, and the lateral branches have just sufficient room, no more, to develop themselves properly, and receive in due time a proper check in their horizontal growth, so as to secure a tall, well-proportioned trunk, without the risk of becoming too bushy.

4*th*, The ground best adapted for poplar being such as would produce luxuriant crops of whatever kind, might be turned to profitable account in several ways.

5*th*, Where the herbage is peculiarly coarse or rank, and calcu-

lated to choke very small plants, the trees should not be less than 5 or 6 feet high when planted.

Finally, A small reserve of plants in the corner of the plantation, from which to supplement any blanks that may occur, would meet most requirements.

Planting being finished, it may be asked, What further treatment do the trees require? We answer, None, save the exercise of a little light work. Pruning is undesirable—thinning is not required. The latter, indeed, could be of no advantage at the distance at which the trees are planted apart, and would only lessen the value of the crop as a marketable article. Where thinning is truly required, it should by no means be withheld; but let it be remembered that where it cannot positively benefit it certainly does harm. The evils resulting from it are visible in those trees contiguous to the ones cut down. The former sometimes are seen to languish—more frequently the side of the tree confronting the one removed becomes hardened to such a degree as often to obstruct the ascent of the sap in the vessels of the wood. This accounts frequently for trees of stinted growth. Another evil is the exposing a tree, generally as bare of roots as of branches, to the force of the wind, and thus rendering it liable to be blown down. Again, the branches which have lost their vitality, on being thus submitted to the influence of light, heat, and drying winds, soon become baked and dried, and thus remain years longer upon the trees, and so fester into the wood, and become in time black knots—a serious detriment to stave wood, to which poplar is extensively applied.

Of pruning we have said that it is undesirable—that is, in all cases where it can be avoided. As, however, it is frequently necessary, we shall speak a little of its nature and extent.

1*st,* To counteract the tendency which poplar has of shooting aloft without carrying breadth along with it, care must be taken not to diminish the lateral branches. The common practice of pruning hardwood generally is to bare the stem to about one third of its height. Though as a general rule this system may do, yet it will not answer with poplar. By pruning off the lower branches of that tree, the roots are the greatest sufferers. The evil soon extends to every part of the tree, but want of space forbids details here.

2*d,* Where two top shoots strive for pre-eminence, lop off one of them, leaving the one which is situated on the exposed side of the tree.

3*d,* Where the roots have been injured by removal or otherwise, so as to be unable to nourish the whole of the tree, prune the largest upper branches, but not the lower ones.

4*th,* Where a top becomes spreading, and none of the shoots form an upright leader, cut off the whole top that a new one may

be formed, and watch it when young to direct its upright single growth.

5th, Where the branches are more numerous upon one side than upon the other, so that the tree is induced to grow to one side, assuming a bent form, whence is obtained twisted and warped manufactured wood, in such case reduce the branches upon that side to which the tree inclines, that the evil be counteracted.

6th, Another case where pruning is of great service is that in which branches grow out from the stem at such acute angles as to fester the bark between the two surfaces of the branch and trunk. Other evils attending such branches are their liability to split off with wind, snow, &c. The pruning chisel is used for large trees.

7th, Another necessity for pruning arises from dead or decayed branches, which, unless quickly removed, produce injurious results by festering into the trunk, as already noticed, and causing black knots in the wood, which detracts from its value. The blemish in the wood occasioned by the removal of a dead branch is no doubt serious, but much less so than allowing it to remain. Pruning is nothing more than art assisting nature in ridding herself of an encumbrance.

Pruning of dead branches should take place about April, that of live branches in June or July.

The writer having thinned plantations in almost every stage of growth of which poplar formed more or less a part, he will instance a few cases as to the relative size and value which the latter bears to the other trees grown along with it.

Species of Trees.	Average Content per Tree.	Price per Foot.	Value per Tree.	No. of Trees per Acre.	Value per Acre, as if of one Species.
		s. *d.*	*s.* *d.*		£ *s.* *d.*
Alder, . . .	6 feet	0 8	4 0	150	30 0 0
Ash, . . .	4 ,,	1 6	6 0	,,	45 0 0
Birch, . . .	5 ,,	0 8	3 4	,,	25 0 0
Larch, . . .	2 ,,	1 2	2 4	,,	17 10 0
Scotch Pine, .	8 ,,	0 10	6 8	,,	50 0 0
Spruce, . .	8 ,,	0 9	6 0	,,	45 10 0
Oak, . . .	2 ,,	1 6	3 0	,,	22 10 0
Gray Poplar, .	18 ,,	0 8	12 0	,,	90 0 0
Black Italian Poplar,	20 ,,	0 8	13 4	,,	100 0 0

No. 1 was a plantation in the south of Roxburghshire situated at an altitude of about 250 feet. The soil was soft, deep black moss, thrown open with numerous drains. These in time of rain were filled with dark sluggish water, fed by unnumbered rills descending on all sides from the extreme heights of the Scottish

Border. Nevertheless the plantation seemed to thrive well in its moist situation. When thinned it was about forty-five years old, and had throughout the period of its growth received the usual attentions of thinning, pruning, &c.

From the above it will appear how much larger is the poplar than any of the other trees; and considered as a nurse instead of the larch, spruce, or pine, how much better it pays than they do. The table in an extended form shows the value per acre of the planted ground.

No. 2 is also a plantation in the south of Roxburghshire about eighty years old, composed of the following species of trees, and extended as above in order to show more clearly the relative values per acre. The soil was clay loam upon sandstone rock, exposure west, rather sheltered.

Species of Trees.	Average Content per Tree.	Price per Foot.	Value per Tree.	No. of Trees per Acre.	Value per Acre, as if of one Species.
		s. *d.*	*s.* *d.*		£ *s.* *d.*
Oak, . . .	10 feet	1 6	15 0	120	90 0 0
Ash, . . .	16 ,,	1 6	24 0	,,	144 0 0
Elm, . . .	12 ,,	1 4	16 0	,,	96 0 0
Beech, . . .	25 ,,	0 7	14 7	,,	87 10 0
Black Italian Poplar,	80 ,,	0 8	53 4	,,	320 0 0
Gray Poplar, .	60 ,,	0 8	40 0	,,	240 0 0

No. 3 is a mixed plantation in Morayshire, composed of the following species of trees. It stands at an altitude of 700 feet, and is exposed on all sides except the north-east. Its soil is poor and sandy. Age of plantation, forty-eight years.

Species of Trees.	Average Content per Tree.	Price per Foot.	Value per Tree.	Number of Trees per Acre.	Value per Acre, as if of one Species.
		s. *d.*	*s.* *d.*		£ *s.* *d.*
Spruce, . . .	2 feet	0 6	1 0	200	10 0 0
Larch, . . .	4 ,,	1 0	4 0	,,	40 0 0
Mountain Ash, .	2½ ,,	0 6	1 3	,,	12 10 0
Sycamore, . .	4 ,,	1 6	6 0	,,	60 0 0
Elm, . . .	3 ,,	1 9	5 3	,,	52 10 0
Ash, . . .	3 ,,	1 10	5 6	,,	55 0 0
Oak, . . .	2 ,,	1 8	3 4	,,	33 6 8
Gray Poplar, . .	12 ,,	0 7	7 0	,,	70 0 0
Black Italian Poplar,	10 ,,	0 7	5 10	,,	58 6 8
Aspen Poplar, .	8 ,,	0 7	4 8	,,	46 13 4

The above statement gives prices equal to those obtained for finest quality of wood in the district. Owing to the dryness of

the ground, and the trees never having been thinned, they are small for their age.

No. 4 is a mixed plantation in Banffshire, favourably situated.

Species of Trees.	Average Content per Tree.	Price per Foot.	Value per Tree.	Number of Trees per Acre.	Value per Acre, as if the whole were of one Species.
		s. *d.*	*s.* *d.*		£ *s.* *d.*
Sycamore, . .	4 cubic ft.	1 6	6 0	150	45 0 0
Ash, . . .	4 ,,	2 0	8 0	,,	60 0 0
Elm, . . .	4 ,,	2 0	8 0	,,	60 0 0
Horse Chestnut, .	3 ,,	0 8	2 0	,,	15 0 0
Alder, . . .	3 ,,	0 8	2 0	,,	15 0 0
Lime, . . .	3 ,,	0 10	2 6	,,	18 15 0
Birch, . . .	3 ,,	0 8	2 0	,,	15 0 0
Norway Maple, .	3 ,,	1 6	4 6	,,	33 15 0
Oak, . . .	3 ,,	2 3	6 9	,,	50 12 6
Balsam Poplar, .	5 ,,	0 8	3 4	,,	25 0 0
Carolina Poplar, .	16 ,,	0 8	10 8	,,	80 0 0
Black Italian Poplar,	17 ,,	0 8	11 4	,,	85 0 0
Abele Tree, . .	6 ,,	0 8	4 0	,,	30 0 0

In the preceding table, No. 4, the prices stated were those realised at a public auction on 22d September 1866. The trees which brought said prices were the best of those thinned out, which were equal to any remaining.

No. 5 is a mixed plantation in Cheshire, England. The great superiority of the poplar to all the other species of trees so attracted the writer's attention in September last, as to lead him to make a minute examination of it, of which the following is the result :—It lies low ; soil, wet clay ; altitude, 100 feet ; age, thirty-five years.

Species of Trees.	Average Content per Tree.	Price per Foot.	Value per Tree.	Number of Trees per Acre.	Value per Acre, as if all one Species.
		s. *d.*	*s.* *d.*		£ *s.* *d.*
Oak, . . .	3 feet	2 0	6 0	150	45 0 0
Ash, . . .	3 ,,	2 0	6 0	,,	45 0 0
Spruce, . . .	2½ ,,	0 10	2 1	,,	15 12 6
Scotch Pine, . .	4 ,,	0 10	3 4	,,	25 0 0
Black Italian Poplar,	35 ,,	0 10	29 2	,,	218 15 0
Alder, . . .	5 ,,	0 10	4 2	,,	31 5 0
Lime, . . .	4 ,,	1 0	4 0	,,	30 0 0
Larch, . . .	2 ,,	1 0	2 0	,,	15 0 0

From the above table, it will appear that on ground where larch has all but proved a complete failure, black Italian poplar succeeds to the best advantage. In such circumstances the anticipations of the Highland Society seem fully realised.

The preceding tables show the relative value of poplar to that of other trees. As to its management when mixed with them, the poplar should either be taken out at an early stage of growth, or have the side branches *snag-pruned,* which means cutting the branches at some distance out from the trunk, so as to allow the small lateral ones to take their place.

With most trees it is best to grow them in *masses.* Poplar forms an exception to this rule. From its tendency to assume an upright direction without much spread of top, the black, black Italian, and gray, grow very profitably as *single* trees.

A fine specimen of black Italian, growing *singly,* is to be seen on the roadside, about a mile north of Jedburgh, in Roxburghshire, at an altitude of 100 feet. It is said to be ninety years planted, is 85 feet in height, with a clean stem of nearly equal thickness for 30 feet, but the top has suffered by the wind. Three feet from the ground it girths 12 feet, at 20 feet its girth is not much less, and at 40 feet it girths about 8 feet. Content of tree, 250 cubic feet. Covering with its branches an area of 1600 feet, twenty-seven such trees would grow upon an acre, equal to 6812 cubic feet, which, at 8d. per foot, is = L.227, 1s. 8d.

Fine specimens of Abele poplars are to be seen in the pleasure grounds at Cullen House, Banffshire, having the following measurements:—Height, 60 to 70 feet; girth at 6 feet from the ground, 6½ feet; height of trunk to lower branches, 30 feet; distance apart, 30 feet; average content, 50 feet; age, sixty years.

The value per acre of such a crop of poplars stands thus:—Forty-eight trees multiplied by 50 feet = 2400 cubic feet, which at 8d. per foot = L.80. Again, L.80 divided by 60, gives L.1, 6s. 8d. as the yearly return. Such ground, also, for grazing purposes, is worth L.20 per acre.

In a small plantation upon the Earl of Harrington's estate, in Cheshire, the writer made an examination of black Italian poplar in September last, of which the following is a statement:—Age of trees, forty years; soil, stiff deep clay-loam; distance apart, 15 feet; height, 50 feet; girth of trees at 3 feet from the ground, 5 feet; cubic content, 30 feet. And the following is the value per acre:—At 15 feet apart, 193 trees stand upon an acre, which, multiplied by 30, the number of feet, gives = 5790 feet, which, at 8d. per foot, is L.193. The latter sum divided by 40, gives L.4, 16s. 2d. as the annual return. Similar ground lets at from 20s. to 25s. per acre.

What enhances the value of poplar is the great demand for it

on the part of all tradesmen. No wood is so suitable for cutting boards, such as are used by shoemakers, saddlers, &c., as poplar. It is much used also for lining for carts, inch boards for this purpose being sold at 16s. per 100 superficial feet. Poplar is also well adapted for bed-room purposes, such as floors. Some of the bed-room floors in Gawsworth Hall, Cheshire, are laid with black Italian poplar, which has stood nearly seventy years, and is still in an excellent state of preservation, equalling that of the Scotch pine floors in the same house, laid at the same period. As paling rails it endures as long as spruce. For split palisades it lasts nearly as long as larch, is well adapted for weather boarding, and sarking for slate roofs. For farm and rural purposes it lasts about as long as Scotch pine, save for posts in the ground, in which case it rots soon near the surface. It is first-rate for plaster lath, and may either be split or sawn; the heart-wood is less worm-eaten than the sap-wood of oak or fir. In America it is in great requisition for paper manufacture, for which purpose it is highly approved; and it may soon be called into requisition in this country for a similar purpose. As coppice-wood all the species enumerated in this paper (except balsam) answer well, and in Staffordshire, where it is much used for crates, it pays the grower handsomely. As hop-poles it is also in great demand; and in Kent, Surrey, and Sussex, it pays well for the above purpose. The bark of the poplar contains also a considerable amount of tannin, which renders it of value about equal to that of the bark of larch, at present about 60s. per ton, but seldom used owing to scarcity.

The principal source of demand, however, as has already been stated, is for break-blocks for railway-carriages. For this purpose poplar answers better than any other kind of wood. In manufacturing break-blocks the following practice is adopted:— The trees are cross-cut into 10 or 15 feet, or any other suitable length for cartage, and sawed into planks $3\frac{1}{2}$ inches thick, width not less than 9 inches. The planks are then laid flat, and, by means of a mould and chalk, the blocks are shaped into the proper size. Poplar is also, as we have said, extensively used for staves for barrels, for which purpose it brings a good price.

Some idea may be formed of the value of poplar from the large prices realised for the wood at public sales in different parts of the country, of which the following is an abstract:—

At a public sale in the suburbs of Perth, in March 1866, among others sold was a root cut of black Italian poplar, 35 feet in length, containing 107 cubic feet, which realised L.9, 15s., or 1s. $9\frac{3}{4}$d. per foot. The top of it contained 30 feet more, and realised 1s. per foot, making the entire price of the tree L.11, 5s., nearly 1s. $7\frac{3}{4}$d. per foot. At a public sale at Gordon Castle, Banffshire, in January 1866, amongst others was sold a gray poplar, con-

taining 107 cubic feet, which realised L.3, 11s. = 8d. per cubic foot. At a public sale at Cullen House, Banffshire, in September 1866, some white Egyptian and black Italian poplars were sold, which realised 8d. per cubic foot. At a public sale near Dalkeith, in April 1866, a tree of the black poplar species was sold, which realised L.3, 15s., or 1s. 3d. per foot. Other instances might be cited, but being of a similar nature, are withheld as unnecessary.

At the above sales no preference seemed to be given to one species more than another, provided the tree was sound. Let it be remembered that the black, black Italian, and large-leaved Abele (*Populus argentea*) are the soundest—the balsam, Ontario, and aspen being frequently ring-shaken, or perforated with a species of grub. As we have seen, the value of the poplar is great, and the purposes to which it is applied are numerous and always on the increase, the demand much exceeding the supply.

In conclusion, we may observe that in order to grow poplar, so as to secure the greatest amount of available wood, the following rule should be attended to:—Let the tree, of whatever species, have a girth corresponding with its height—that is, have as many inches in girth at the surface of the ground as it has feet in height. By thinning and pruning, the power lies very much in the hands of the operator to make the tree what he pleases. Let this power of directing the course and inclination of the tree be exercised as soon as possible; for, to use an old proverb, "just as the twig is bent the tree inclines."

The following remarks conclude our subject:—Poplar should only be planted upon such soils as receive the roots freely. Loose soil, though poor, is better for poplar than retentive soil of better quality. The rate of growth will always depend upon the facility with which the plant derives its nourishment. All thinning of poplar should be effected when it is young, and never continued after the branches drop off from decay. One principal point is, to secure as many lateral branches as possible upon the young tree, and direct their course. The rapidity of growth, soundness of wood, and size of the tree, depends almost entirely upon the quantity of branches. If properly clothed with these, it should make layers of wood $\frac{1}{4}$ of an inch thick, and be a source of profit to the proprietor upon clay land greater than can be derived from any other species of tree.

We subjoin the following table of particulars :—

Order of Hardiness of Quality recommended for Profitable Planting.	Quantity each Species should yield in 60 years.	Order of Durability for outside work.	Order of Durability for in-door work.	Order of coming into Leaf.	Order of Liability to produce Suckers.	Order in which Foliage suffers from winds.	Order of Soundness of Wood.	Order of Age to be cut at as Ripe.	Order in which the Roots become Decayed.
	Feet.								
1. Black Italian,	80	1	1	5	5	4	1	80	9
2. Abele Tree, .	60	4	2	4	1	5	2	70	10
3. Black Poplar,	60	2	3	6	4	6	3	80	8
4. Aspen „	30	5	4	7	2	10	9	50	7
5. Gray „	40	3	5	8	3	7	4	60	6
6. Carolina „	40	6	6	10	7	9	8	60	2
7. Tacamahac, .	40	10	9	2	6	2	10	50	1
8. Broad-leaved,	30	8	8	3	8	1	7	50	3
9. Smooth-leaved,	30	7	7	9	9	8	5	60	5
10. Heart-leaved,	30	9	10	1	10	3	6	50	4

REPORT ON PHOSPHATIC AND AMMONIACAL MANURES.

By Robert J. Thomson, Grange, Kilmarnock.

[*Premium—Ten Sovereigns.*]

Artificial manures, in spite both of the nitrogen and the mineral theories, are practically comprised in two great classes : *Ammoniacal*—or, what would, perhaps, be a better term, *Nitrogenous*—and *Phosphatic;* and according to the quantity and condition of these constituents in a manure, so is its value. In stating this so broadly, we do not for one moment assert that either nitrogen or phosphoric acid is more valuable intrinsically than any other plant constituent. It is more probable that each is *alike* valuable. Chemical analysis has revealed the almost unvarying proportional amount of each substance in the plant, and has shown that these are again found in like proportion in the animal. At all events, the amount of each of the *combustible* elements is so large that they, at least, are evidently and indisputably necessary; and the experiments of Prince Salm Horstmar have sufficiently proved, that when any one single constituent of the ash, or *incombustible* matters of the plant, is withheld from the soil, the plant cannot grow to maturity.* Neither do we mean to ignore from a place in the category of artificial manures those substances other than phosphatic and nitrogenous

* "Anderson's Agricultural Chemistry," p. 63.

selling in the market—such as salts of potash, soda, magnesia, and others. We merely affirm that the small quantity of these sold for manuring purposes, and the discordant, and often unprofitable results arising from their use, do not entitle them in the present state of agricultural practice to a *locus standi* with those in question.

It is not our intention to descant here upon the theories above referred to, however akin to the subject it may be, further than to remark that much has been said and written regarding each, which is calculated to mislead the practical farmer, and to destroy his confidence in agricultural chemistry. Advancing science has now, however, brought many new facts to light, and the extreme views of the partisans of both theories are very considerably modified. One thing is certain, the immense consumpt of bones and other phosphatic manures is proof positive that those containing nitrogen alone are not all-essential; and, on the other hand, the large quantity of sulphate of ammonia and nitrate of soda applied alone to some of our crops, and used for mixing with manures for others, shows equally plainly that nitrogenous manures are also requisite.

The fact of farmers having, from time immemorial, sold off the farm the grain, dairy produce, and stock,—all containing a large proportion of "phosphatic and nitrogenous" elements,—without having made an equivalent return, might have been sufficient to have led one to predicate, *à priori*, that great increase of crops would follow the replacement of these substances, and that fact surely accounts, to some extent at least, for the advantageous results which happily follow their application.

In the following pages we shall attempt to consider—1*st*, In what relative proportions phosphatic and nitrogenous elements should prevail in our manures; and, 2*d*, What are their comparative effects on our crops.

In considering fully the first question, many circumstances would fall to be noticed, which not only could not be detailed within the limits of this report, but which would involve speculations regarding matters about which but little is known, such as the absorptive properties of soils; the questions arising from the fact of a phosphatic manure having caused a great increase of crop in a soil comparatively rich in phosphates, and having produced but little effect on a soil containing an almost inappreciable quantity; the decomposition of the manures applied, and the formation of new compounds which take place in and with the soil;—these we leave, and merely state a few general results which practice seems to confirm, and which may tend to guide in the making up of "home mixtures" for our field plants. What the relative proportions of phosphatic and nitrogenous elements in a manure should be, depends to a very considerable

extent on the soil to which it is to be applied. The chemical composition of the soil varies greatly, and it would be folly to suppose that So and So's "potato manure," or "wheat manure," even although found to have the best proportion of phosphatic and nitrogenous elements for one class of soil, should be equally adapted to others. The object for which we supply all special manures is either to supply the soil with some element or elements in which it is deficient, or to counteract the injurious predominance of some constituent in the soil. The chemical composition of the soil is therefore altered by every such application. What wonder, then, that farmers should find on fields to which guano, or any other special manure, has been applied year after year, "thas guano does not 'tell' as it used to do." We think it may be laid down as a general rule, to which there may be many exceptions, "that the heavier, or, in other words, the more clayey the soil, the larger should be the relative proportion of nitrogenous to phosphatic elements in the manure, and *vice versa*."

The best proportions in which these substances should exist in a manure, depend to a great extent, also, on the plant to which it is to be applied. Some plants, such as wheat and Italian rye-grass, are benefited by nitrogenous manures alone; while the produce of others, such as yellow turnips, growing on the same soil, is increased only by phosphatic manures; not that a crop of turnips takes less nitrogen from the soil than does a crop of wheat, for the reverse is the case. An average crop of the former takes 60 lbs. nitrogen, while an average crop of the latter takes only 45 lbs.;* and this leads to the remark, that the analyses of plants afford no criterion to the farmer what should be the most profitable proportional quantity of phosphatic and nitrogenous elements to apply in the manure.

We have found to a certain extent, "that the longer that a plant takes to grow, the greater is the benefit derived from *nitrogenous* manures; and the shorter, the greater the benefit from *phosphatic* manures." Whatever may be the cause, this hypothesis is, so far at least, backed by practice. With the cereals, wheat is oftenest grown with purely nitrogenous manures—nitrate of soda, for instance; to oats, a proportion of phosphates is added, Peruvian guano being a very common manure for that crop; to barley the proportion of phosphates is increased, and it is said that if the barley be sown late, the proportion of phosphates may be still further profitably increased. With green and root crops the same is the case; cabbage requires the largest proportion of the manure to be nitrogenous; for mangold, the proportion of phosphates may be increased; for swedes, still further; while for

* Dr Anderson, in "Transactions of Highland Society," March 1861, p. 568.

yellow and white turnips, in most turnip soils the nitrogenous element almost disappears, and the manure becomes principally phosphatic. Beans seem to form an exception to this rule, as we find they are grown in some parts with manures principally phosphatic; but it may be said that beans belong to a different order of plants, and that possibly the same gradation takes place with the leguminosæ. Italian ryegrass, again, is grown with great rapidity by means of purely nitrogenous manures alone. But the definite proportion seems so constant with the others before mentioned, that we have thought if the best proportional amount of phosphatic and nitrogenous elements could be definitely found for a number of these plants growing on the *same* soil and under the *same* circumstances, that, having found the best proportion for any *one* of them on a *different* soil, a fair idea might be formed of what would be the best proportions for the other plants. With a view to this, we made some experiments, of a preliminary kind, during the present season on cabbages, carrots, mangolds, swedes, and yellow turnips. The returns of the cabbages cannot be got ready for this report, but will probably appear at some future time. Suffice it to say, that 3 cwt. of superphosphate added to 3 cwt. of Peruvian guano, gave no increase of crop over that grown on 3 cwt. guano alone. The carrots did not braird even enough for an experiment, and as there was a blank here and there throughout, we did not think proper to weigh the crop. The results from the mangolds, swedes, and turnips are given below.

The carrots and mangolds were grown on contiguous plots in one field, which was manured on the stubble in autumn with 30 loads ash-dung per acre. The cabbages, swedes, and yellow turnips were on contiguous plots in another field, manured also on the stubble with 25 cubic yards of farmyard dung. The Peruvian guano contained nearly 19 per cent. of ammonia and 22 per cent. of phosphates. The superphosphate was analysed by Dr Anderson, with the following results :—

Moisture,		17·65
Organic matter,		16·28
Biphosphate of lime,		15·92
Equal to soluble phosphates,	(24·85)	
Insoluble phosphates,		7·15
Sulphate of lime,		39·76
Alkaline salts,		0·89
Sand,		2·35
		100·00
Ammonia,		1·17

RESULTS OF EXPERIMENTS WITH PHOSPHATIC AND AMMONIACAL MANURES ON ROOT CROPS.

MANGOLDS.

Manures.				Weight of Bulbs.								Per Acre— Mean.				Leaves— Crop of.				"Shot."					
				First Plot.				Duplicate.												"Shot."		Weight per Acre.			
Ash Dung.	Peruv. Guano.	Super-phos.	Salt.	tons.	cwts.	qrs.	lbs.	tons.	cwts.	qrs.	lbs.	tons.	cwts.	qrs.	lbs.	tons.	cwts.	qrs.	lbs.	Per Cent. Plots. 1	2	tons.	cwts.	qrs.	lbs.
loads.	cwts.	cwts.	cwts.																						
30	10	...	...	14	7	3	7	14	8	0	14	14	7	3	24	9	18	3	...	36	40	5	8	3	...
30	10	...	2	15	10	2	14	15	8	1	21	15	9	2	3	9	16	3	14	37	39	5	4	7	...
30	...	10	...	11	14	0	7	12	15	3	21	12	5	...	...	6	18	3	...	12	13	1	4	1	14
30	...	...	6	9	12	2	...	9	19	1	14	9	15	3	21	6	5	2	14	14	12	1	2	2	...
30	...	...	...	9	3	3	...	10	7	3	7	9	15	3	3	7	10	...	(?)	9	10	...	17	3	7
30	4	...	2	12	7	0	21	12	18	0	14	12	12	2	17	...	...	...	...	24	25	2	14	1	14
30	4	1	2	12	18	0	14	13	15	2	14	13	6	3	14	...	...	...	...	23	24	2	13	1	14
30	4	2	2	13	0	1	7	14	4	1	14	13	12	1	10	...	...	...	...	24	23	2	18	0	14
30	4	3	2	14	7	3	7	14	7	3	7	14	7	3	7	...	...	...	...	23	24	2	16	1	...
30	4	4	2	14	4	1	14	14	6	2	7	14	5	1	24	...	...	...	...	25	25	3	...	3	21?
30	3	1	2	10	16	2	7	12	2	3	7	11	9	2	21	...	...	...	...	23	23	2	12	2	...
30	3	2	2	11	9	2	21	12	13	3	...	12	1	2	24	...	...	...	...	24	24	2	17	...	14
30	...	...	...	9	13	3	...	9	16	3	14	9	15	1	7	...	...	...	...	11	11	...	19	2	21

SWEDES.

Manures.				Weight of Bulbs.																Weight of Leaves.											
				Plot 1st.				Plot 2d.				Plot 3d.				Mean.				Plot 1st.				Plot 2d.				Mean.			
Farm-Yard Dung.	Peruvian Guano.	Superphosphate.	Salt.	A tns.	cts.	qrs.	lbs.	tns.	cts.	qrs.	lbs.	tns.	cts.	qrs.	B lbs.	tns.	cts.	qrs.	lbs	tns.	cts.	qrs.	lbs	tns.	cts.	qrs.	lbs.	tns.	cts.	qrs.	lbs.
Cubic Yards.	cwts.	cwts.	cwts.																												
25	10	...	...	23	13	0	14	27	10	...	...	22	17	3	7	24	13	2	16	7	...	...	...	7	13	0	14	7	6	2	7
25	...	10	...	12	19	1	14	15	18	3	...	12	13	0	14	13	7	0	9	3	1	3	14	3	8	3	...	3	5	1	7
25	...	...	6	10	6	1	...	13	18	0	14	9	2	3	7	11	2	1	16	3	2	3	14	3	5	2	14	3	4	1	...
25	...	...	...	10	9	1	14	14	10	2	14	9	10	2	14	11	10	0	23	3	2	2	...	3	5	2	14	3	4	0	7
25	3	1	...	21	1	3	14	26	11	1	...	17	8	1	21	21	13	3	12	5	3	0	14	5	9	1	14	5	6	1	0
25	2	2	...	16	14	1	14	21	8	0	14	14	9	0	7	17	10	2	2	3	18	0	14	4	4	1	14	4	1	1	...
25	1	3	...	14	16	3	14	17	6	3	14	13	5	2	14	15	3	0	14	3	5	2	14	3	15	...	...	3	10	1	7
25	4	...	...	23	8	3	...	27	3	3	...	...	(?)	...	...	...	...	(?)	...	5	6	1	...	5	12	2	...	5	9	1	14
25	...	4	...	16 C	1	3	14	17	10	...	...	...	(?)	...	... D	...	...	(?)	...	3	11	3	14?	3	8	3	...	3	10	1	7?

YELLOW TURNIPS.

Manures.				Weight of Bulbs.								Mean.							
				First Plot.				Duplicate.				Weight of Bulbs per Acre.				Weight of Leaves per Acre.			
Farm-yard Dung.	Peruv. Guano.	Super-phos.	Com. Salt.	A							B								
Cubic yards.	cwts.	cwts.	cwts.	tons.	cwts.	qrs.	lbs.	tons.	cwts.	qrs.	lbs.	tons.	cwts.	qrs.	lbs.	tons.	cwts.	qrs.	lbs.
25	10	...	...	18	5	2	14	18	18	1	14	18	12	...	...	6	6	2	7
25	...	10	...	10	15	2	14	10	18	3	...	10	17	...	21	1	19	...	7
25	...	...	6	10	3	...	14	10	12	2	...	10	7	3	7	2	...	2	14
25	...	...	...	10	12	2	...	10	18	3	...	10	15	2	14	2	6	3	14
25	3	1	...	15	12	2	...	16	8	...	14	16	...	1	7	...	...	...	...
25	2	2	...	14	1	1	...	14	10	2	14	14	5	3	21	...	...	...	...
25	1	3	...	12	19	1	14	13	8	3	...	13	4	...	7	...	...	...	...
25	4	...	...	18	5	2	14	18	15	...	...	18	10	1	7	...	...	...	...
25	...	4	...	13	2	2	...	13	8	3	...	13	5	2	14	...	...	...	...
				C							D								

The soil in the field in which the mangolds were grown is of a mossy character, containing a considerable quantity of organic matter, and well adapted for the growth of that root, but the season being cold, and for the most part wet, the crop was under average. The field in which the swedes and turnips were grown is heavy clay, and certainly about the worst description of land for proving the excellence of phosphatic manures. The comparative effects, therefore, of the different proportions of phosphatic and nitrogenous elements on the increase of the crop of mangolds are not comparable in these results with those of the swedes and turnips, nor even, indeed, are the latter two comparable, for the turnips were grown on a stiffer piece of ground than the swedes. The crops of swedes and turnips were likewise rather under average. The land on which the experiments with mangolds were made seems to have been very uniform, although rather better in one set than the other. The plots of the swedes experiments stood exactly in the same relative position as they are here set down; the distance from A to B being 215 yards, and from A to C 27 yards. We were quite aware of the variation of the soil from A to B, but had no idea that any existed from A to C. These results show, however, that the soil gradually increases in fertility from A to C, but a deficiency of "nothing" plots precludes the possibility of estimating how much. It is impossible that they could be influenced in any way, one more than another at least, by previous manuring, or the old ridges, for they were purposely run across the line of the old ridges. We believe the change in the soil to be gradual. The same remarks apply to the yellow turnips.

The 2 cwt. salt added to 10 cwt. guano for mangolds has given a marked increase of crop; we have invariably found such to be the case with mangolds. The "6 cwt. salt" seems to have been too large a quantity, as it has given no increase of crop. It is probable that had a plot been manured with 10 cwt. salt, the produce would have been smaller, for "6 cwt. salt," both on swedes and turnips, has had a deleterious effect. This is not to be wondered at; the land on which they grew is only about six miles from the sea, whence during stormy weather a considerable quantity of salt is brought in the rain or spray.

The effect of nitrogenous manures on the leaves of all of these plants, and particularly on the percentage of "shot" mangolds, is very striking. In judging the crops before pulling them, we had set down the mangolds on Nos. 1 and 2 at "from 19 to 20 tons" per acre, and those on Nos. 3, 4, and 5 at "about 10 tons" per acre. There was no apparent difference in the latter three lots. We also made errors to a similar extent in our "notes before pulling" with the swedes and turnips on these same manures; and had it not been that the numerous results on the

similar experiments all confirmed each other, we would have thought that some error must have been committed in weighing.

All the "shot" mangolds were lifted before the others, and were counted as pulled, and thrown into the cart. They were then "topped and tailed," and weighed. We may here mention that the *whole* crop on all the plots was weighed. In some remarks on experiments of a similar kind made last year (see "Transactions," p. 156), in which the percentage of shot mangolds increased pretty much in the same ratio as the crop from different manures, we surmised "that the larger crops, being perhaps more mature, might possibly account for that circumstance." It is evident, however, from these experiments, that both the "shot" mangolds and the leaves owe their increase entirely to nitrogenous manures. Four cwt. guano gave nearly as large a crop of bulbs in each case as 10 cwt., but nothing like such a crop of leaves or "shot" mangolds. Nor is this increase owing to the larger crops being more matured; for we believe the most matured crops, in every case, were those on the phosphatic manures, particularly on the "10 cwt. superphosphate." The leaves on this plot looked more bulky than those on the "6 cwt. salt," and the "nothing" plots, till shortly before being pulled, when they gradually became yellower than the others—more matured, in other words—and diminished in bulk. We noticed this particularly on some experiments with "soluble and insoluble phosphates." The leaves on the "soluble" plots, although much bulkier than those on the "insoluble" plots, during the greater part of the season, had got so ripe and diminished in bulk shortly before being pulled, that there was no perceptible difference between them and those on the "insoluble" plots; and, indeed, so much was this the case, that we began to expect as large a crop from the insoluble as from the soluble manures, which was not the case; but might not this circumstance account in some degree for the prevalence of the idea, that "soluble phosphates" do no good towards the end of the season? The leaves in the "10 cwt. guano" plots looked green, fresh, and luxuriant, as if they were *not* ripe, and would have grown for some time.

We have put a query (?) after those which seem to us to be doubtful, and would have our readers to place no confidence in those so marked. The 7 tons 10 cwt. of mangold leaves off the "nothing" plot, we believe to be erroneous; there was no apparent difference between that plot and the two immediately preceding before being pulled.

From these experiments, we may presume that nitrogenous manures greatly increased the crop of leaves on mangolds, swedes, and turnips; that they tend to induce mangolds, either directly or indirectly, to run to seed. (It seems to us more probable that this tendency to "run to seed" is *indirectly* produced by

the greater succulence, and therefore possibly the greater tenderness of the plant on nitrogenous manures, increasing its liability to be checked by frost, &c.; and we think that probably the comparative effects of these manures on mangolds running to seed will be different in every season; the difference last year was not nearly so striking.) Another presumption which we may draw from these experiments, is the fallacy of judging the weight of crops grown with different manures by appearance when growing. It is deserving of notice, that the difference of the crop of mangolds grown with "10 cwt. superphosphate," and that with "6 cwt. salt," was not discovered, even when lying on the ground topped and tailed; and we are led to ask, Might not those grown with superphosphate be of greater specific gravity? This is very probable; it was found to be the case last year, and we have forwarded samples of each of the first five plots of mangolds, and the first four plots of swedes and turnips, to Professor Anderson for analysis; the results of which, it is expected, will throw some further light on the comparative effects of "phosphatic and nitrogenous manures."

REPORT ON THE CULTIVATION OF MANGOLD WURZEL.

By Robert J. Thomson, Grange, Kilmarnock.

[*Premium—Five Sovereigns.*]

Mangold wurzel, or, in botanical phraseology, *Beta vulgaris campestris*, belongs to the genus Beta, class Pentandria, and order Digynia, of the Linnean classification, and Chenopodea of the natural classification.

It was introduced into Britain from the Continent during the latter part of last century. The exact year, however, is disputed, but probably it was in 1773, by the celebrated Dr Lettsom.

It still retains the original German name, many corruptions of which—such as mangle, mangel, wurtzel, wortzel, &c.—have found their way into use, and disfigure even the seed catalogues and circulars of not a few of our leading seedsmen. Any one may satisfy himself, by turning up a good German dictionary, that mangold (meaning beet) wurzel (meaning root), is the proper rendering. It has also been designated "the root of scarcity." This, we think, must have been the invention of some *enterprising* seed merchant, or, at best, the translation of some would-be German scholar, seeing the word *mangel*, which has nothing whatever to do with mangold, means want.

For many years after its introduction it did not become at all popular, probably because of the mode of culture adopted; but ultimately it rapidly won the favour of all classes of agricul-

turists, and, at the present day, in every homestead throughout the length and breadth of "merrie England," mangold wurzel has become "familiar as a household word." Its cultivation has not, however, extended with like rapidity north of the Tweed, simply because the cloud-covered skies and colder air of the "land of the mountain and the flood" are anything but congenial to the warmth-loving mangold.

The statistics collected by the Highland and Agricultural Society in the years 1854 to 1857, show that, in the former year, 1950 acres of mangolds were grown in Scotland, and in the latter 2800; above a third of which breadths were returned by Ayrshire alone. Wigtownshire ranked second as a mangold-growing county.

Average Crops.—It has often been said that it is as easy to grow 30 tons mangolds as 20 tons swedes in the south of England, and *vice versa* in Scotland. Table I. shows the cultivation, manuring, average crops, and comparative acreages of a number of growers in several different parts of the kingdom.

Extra Crops.—In 1859, crops weighing 39, 34, and 31 tons respectively per acre were grown in East Lothian (see "Highland Society's Transactions, 1860"). In 1854, Mr Birch (whose name appears in the following table) grew 4 acres, averaging 50 tons, manured with 22 tons cow dung and 3 cwt. Peruvian guano, in drills 27 inches apart, and bulbs 12 inches apart. A neighbour of his, in the same year, grew 3 acres, averaging 52 tons 18 cwt. per acre, manured with 25 tons street dung applied in autumn, and 25 tons cow dung and 1½ cwt. Peruvian guano applied in spring; drills 25 inches, and bulbs 10 inches apart. The soil in both cases was a deep loam, and the variety grown the long red. In the island of St Helena crops of 66 and 77 tons respectively per acre have been raised ("Rural Cyclopædia"); and we have it on good authority, that 80 tons have been drawn off one acre in the market gardens near London. The largest crop we have heard of was grown by M. de Gasparin in France. It weighed 109½ tons per acre. The seed was sown in a hotbed in January, transplanted, as thick as the finger, in April, to the distance of 13 inches apart every way, on highly manured and deeply trenched ground, and hoed and irrigated every fortnight afterwards.

Weight of Bulbs.—If drills are 27 inches wide, bulbs 12 inches apart, and the crop weighs 30 tons per acre, the average weight will be about 3½ lbs. At 20 tons per acre, and same distances, it will be about 2⅓ lbs. We have seen at some of our agricultural shows bulbs weighing above 30 lbs. Two roots were sent home from St Helena, each weighing 56 lbs.; and M. de Gasparin mentions one which weighed 132 lbs.!

TABLE I.—England.

Name of Grower.	Farm.	County.	No. of Years Grown	Chief Variety.	Soil.	Seedtime.	Is the Seed Steeped?	Farmyard Manure applied per acre in Autumn.	Farmyard Manure applied per acre in Spring.	Auxiliary Manure per acre in cwts. Peruv. Guano	Auxiliary Manure per acre in cwts. Super. Phos.	Auxiliary Manure per acre in cwts. Salt.	Dis. apart in inches of Drills.	Dis. apart in inches of Bulbs.	Average weight per acre in tons of Mang.	Average weight per acre in tons of Swede	Average weight per acre in tons of Turnip	Average annual acreage in Mang.	Average annual acreage in Swede	Average annual acreage in Turnip
									cub. yds.				on the flat							
F. W. Wyatt	Nutbourne	Sussex	30	Orange globe	Deep hazel mould	May 1–15	Yes	...	20	...	3	4	22	15	33	20	18	20	14	16
Butcher	Epsom	Surrey	25	Yellow globe	Clay	End of April	Yes	...	30	1	4	...	28	10	25	16	...	12	20	...
J. J. Mechi	Tiptree	Essex	15	Yellow globe	Stiff yellow clay	End of April	Yes	tons 15	...	4	...	2	28	12	28	15	18	13	5	4
J. Dunn	Dumbleton	Worcester	7	Yellow globe	Mixed land	Apr. 10 to 20	Yes	cub. yds. 15	...	...	2½	...	27	13	35	...	...	12	none grown	
Thomas Black	Beckford	Gloucester	5	Yellow globe	Strong clay	2d to 3d week of April	No	15	...	...	2	...	24	12	35	...	...	6	none	none
N. G. Hutchinson	Gondford	Cambridge	10	...	Black fen clay land	About April 28	No	...	loads 10	...	3	...	24	18	30	...	...	20	...	...
David Smith, jun.	Martley Hall	Suffolk	8	Yellow globe	Clay & clay subsoil	End of Ap. to mid. May	No	sometimes	sometimes	none	none	none	24	14	28	15	18	15	3	7
D'Urban Blythe	Massingham	Norfolk	40	Yellow globe	Deep loam on clay	April 25 to May 6	No	...	mostly	2½	...	4	27	12	25	17	16	proportional 1-5th	3-5ths	1-5th
Robert Birch	Nethertton	Lancashire	14	Long red	Deep clay loam	1st week in April	No	tons 30	...	4	...	4	24	12	37	33	...	4	8	...

Scotland.

									cub. yds.											
Young	Highfield	Ayr	11	Long red	Sandy loam	End of April	No	...	30	1½	1½	2	27	11	24	32	28	2	12	4
Hugh Woodburn	Annandale	Ayr	7	Long red	Stiff loamy clay	End of April	No	...	20	3	...	...	26	10	16	20	24	6	10	4
Laird	Williamfield	Stirling	4	Long red	Dry field	About May 1	Yes	...	tons 30	2	2	4	28	14	20	30	...	...	...	...
Paterson	Cowie	Stirling	4	Long red	Peat	April 24 to May 7	No	...	15	3	1	4	28	14	18	...	25	3	8	16
Graham	Keir	Perth	5	Long red & oval yellow	Dry field	May	No	...	cub. yds. 25	1½	sulp.	amon.	28	9	30	35	35	5	5	30
S. D. Shireff	Saltcoats	Haddington	10	Long red	Deep sandy loam	Sown in garden Ap. 20 & transplt. to field	No	tons 20	...	3	3	...	26	14	20	25	28	1	25	18
Wm. Smith	Craigdhu	Wigtonshire	5	Long red & yel. globe	Moss	April 28 to May 10	Yes	...	20	...	6½	2	28	9	17	23	25	3	18	4
Mr Smith gives the average of		Wigtonshire		Principally long red	Moss for Mangolds & gravelly for Swedes	April 28 to May 10	Yes	cub. yds. 25	...	2	3	2	27	10	24	28	30	...	...	...

Climate.—Mangolds grow within a wide range of latitude. Large crops are raised at St Helena at 16° south lat., and they are grown with success in Scotland at 56° north lat.

Soil.—A deep friable loam, abounding in organic matter, is the most suitable; but they are grown in all varieties of soils, even in those of the most opposite descriptions. A light-land farmer says, "We always sow our mangolds on our lightest land, where it is too light for potatoes;" and a heavy-land farmer says, "My mangolds are invariably grown on the stiffest land, where it's no use growing swedes." They are sometimes grown year after year on the same soil. The Rev. R. W. Whitaker, in Lancashire, has grown them for nearly twenty years consecutively on the same ground—a clay soil. The crop has raised from 27 to 32 tons per acre. He manures with farmyard dung, salt, and a mixture of sulphate of ammonia and superphosphate of lime, in the proportion of one of the former to ten of the latter. The late Rev. Mr Hall, near Derby, grew them year after year, for upwards of thirty years, without diminishing in yield.

Varieties.—There are the reds, yellows, oranges, and whites, which are subdivided into long, globe, oval, or olive-shaped. The long red is deservedly a general favourite. The oval yellow is a good sort too. When compared with the long red when growing, it may not appear so bulky a crop; but when an equal breadth of each is weighed, they are generally discovered to be more nearly alike than at first supposed. That sub-variety of the long red, the oxhorn, although a good cropper, is justly objected to, both on account of its straggling across the drills, and thus preventing much sooner than usual the working of the horse-hoe, and likewise because of its leaves being less securely covered from frost than all others. The long varieties seem best adapted for deep or heavy soils, and the globes for those which are shallow or light.

Place in the Rotation and Cultivation.—The mangold occupies the same place in the rotation as the swede, and the well-known mode of cultivation adapted for that root is equally adapted for the mangold. The latter, however, will even better repay *deep* cultivation than the former.

Distances apart of Drills and Bulbs.—"Which are the best distances?" is a question which has been often asked, much discussed, but not yet satisfactorily answered. In Dr Voelcker's "Experiments on Swedes" ("Royal Agricultural Society's Journal," vol. xxii.), we find the following:—"If the soil is shallow and poor, the drills should be at least 26 inches apart, and the plants singled out rather wide; for the roots in that case will extend their feeding fibres on the surface, and require a larger space than in a deep, well-pulverised, loamy soil." This opinion is entertained by not a few; but do not almost all practical farmers

TABLE II.—Result of Experiments with different Manures applied to the Mangold Crop, 1862.

Plots.	Manure per Acre.				'-No.	Weight per Acre.				Average Weight per Acre.			Produce in Excess of Plot 13.			Cost in Excess of Plot 13.			Produce in Excess of Plot 14.			Cost in Excess of Plot 14.		
	Cubic Yards Cow Dung.	Cwts. Peruvian Guano.	Cwts. Super-phosphate.	Salt.	"Shot."	tons.	cwts.	qrs.	lbs.	tons.	cwts.	qrs.	tons.	cwts.	qrs.	£	s.	d.	tons.	cwts.	qrs.	£	s.	d.
1	...	...	...	...	18																		
1°	...	...	...	...	16	Blundered.																	
2	...	10	...	2	37	19	19	1	14	19	5	1	13	14	3	6	14	0	9	4	3	1	1	6
2°	...	10	...	2	36	18	11	1	...															
3	...	8	...	2	...	19	19	1	14	19	17	2	14	7	...	5	8	0	9	17	...	0	4	6*
3°	...	8	...	2	...	19	15	2	14															
4	...	6	...	2	...	18	9	1	...	17	16	1	12	5	2	4	2	0	7	15	3	1	10	6*
4°	...	6	...	2	...	17	3	...	14															
5	...	4	...	2	28	15	16	3	14	15	11	1	10	...	3	2	16	0	5	10	3	2	16	6*
5°	...	4	...	2	27	15	5	2	14															
6	...	4	5	2	35	16	8	...	14	16	1	2	10	11	...	4	8	6	6	1	...	1	4	0*
6°	...	4	5	2	31	15	15	...	...															
7*a*	...	4	5	2	30	17	1	1	...	18	7	2	12	17	...	5	2	6	8	7	...	0	10	0*
7°*a*	...	4	5	2	28	19	13	3	...															
8*b*	...	4	5	2	27	18	18	3	...	18	14	...	13	3	2	5	17	6	8	13	2	0	5	0
8°*b*	...	4	5	2	33	18	9	1	14															
9	...	...	10	2	18	9	15	...	...	10	2	2	4	12	...	3	9	0	...	2	...	2	3	6*
9°	...	...	10	2	23	10	10	...	...															
10	...	...	8	2	...	9	18	3	...	10	...	2	4	10	...	2	16	0	...	...	...	2	16	6*
10°	...	...	8	2	...	10	2	2	...															
11	...	...	6	2	...	11	5	...	...	10	17	2	5	7	...	2	3	0	...	17	...	3	9	6*
11°	...	...	6	2	...	10	10	...	...															
12	...	...	4	2	22	9	14	1	...	9	7	2	3	17	...	1	10	0	†	13	...	4	2	6*
12°	...	...	4	2	20	9	...	2	14															
13	...	...	...	...	20	5	14	1	14	5	10	2	...	...	...	...		...	...	...	...	...		...
13°	...	...	...	...	22	5	6	3	14															
14	25	...	...	...	27	9	15	...	...	10	...	2	4	10	...	5	12	6	...	...	...	...		...
14°	25	...	...	...	23	10	6	1	...															

15	25	...	...	2	...	12	3	3	...	11	12	2	6	2	...	5	16	6	1	12	...	0	4	0
15°	25	...	...	2	...	11	1	1	...															
16	25	...	...	4	...	11	5	...	...	11	8	3	5	18	1	5	18	6	1	8	1	0	6	0
16°	25	...	...	4	...	11	12	2	...															
17*c*	25	...	...	4	23	11	6	3	14	12	...	...	6	9	2	6	0	6	1	19	2	0	8	0
17°*c*	25	...	...	4	25	12	13	...	14															
18	25	3	3	2	26	15	8	...	14	15	14	3	10	4	1	8	15	0	5	14	1	3	2	6
18°	25	3	3	2	28	16	1	1	...															
19*d*	25	3	3	2	...	16	...	2	14	16	12	3	11	2	1	9	9	0	6	12	1	3	16	6
19°*d*	25	3	3	2	...	17	5	...	...															
20*e*	25	3	3	2	...	15	15	...	...	16	9	...	10	18	2	9	10	0	6	8	2	3	17	6
20°*e*	25	3	3	2	...	17	3	...	14															
21*f*	25	3	3	2	38	17	10	2	14	17	12	2	12	2	...	10	4	0	7	12	...	4	11	6
21°*f*	25	3	3	2	41	17	14	1	14															
22	25	3	5	2	...	16	4	1	14	16	12	3	11	2	1	9	8	0	6	12	1	3	15	6
22°	25	3	5	2	...	17	1	1	...															
23	25	3	4	2	...	15	15	...	...	16	4	1	10	13	3	9	1	6	6	3	3	3	9	0
23°	25	3	4	2	...	16	13	3	...															
24	25	3	2	2	...	16	...	2	14	16	9	...	10	18	2	8	8	6	6	8	2	2	16	0
24°	25	3	2	2	...	16	17	2	...															
25	25	3	1	2	...	16	4	1	14	16	8	...	10	17	2	8	2	0	6	7	2	2	9	6
25°	25	3	1	2	...	16	11	3	14															
26	25	4	...	2	...	17	16	1	...	18	2	3	12	12	1	8	8	6	8	2	1	2	16	0
26°	25	4	...	2	...	18	9	1	14															
27	25	4	3	2	...	18	13	...	14	18	...	...	12	9	2	9	8	0	7	19	2	3	15	6
27°	25	4	3	2	...	17	6	3	14															
28	25	2	3	2	...	13	5	2	14	13	11	2	8	1	...	8	2	0	3	11	...	2	9	6
28°	25	2	3	2	...	13	17	2	...															
29	25	1	3	2	...	11	12	2	...	11	17	1	6	6	3	7	9	0	1	16	3	1	16	6
29°	25	1	3	2	...	12	1	3	14															
30	25	...	5	2	...	10	2	2	...	11	...	3	5	10	1	7	9	0	1	...	1	1	16	6
30°	25	...	5	2	...	11	3	...	14															
31*g*	25	...	3	...	...	12	7	2	...	12	16	3	7	6	1	8	15	0	2	16	1	3	2	6
31°*g*	25	...	3	...	...	13	6	1	...															

a. Got 1 cwt. guano and 1 cwt. salt after thinning. *b*. Got 1 cwt. guano, and 1 cwt. nitrate of soda, and 1 of salt later. *c*. Got 2 cwt. salt after thinning. *d*. Got 1 cwt. guano and 1 of salt after thinning. *e*. Got 1 cwt. nitrate of soda and 1 of salt after thinning. *f*. Got 1 cwt. of guano and 1 of salt after thinning, and 1 cwt. nitrate of soda and 1 of salt later. *g*. Got 3 cwt. guano and 2 cwt. salt after thinning; this plot to compare with plot 18. * Cost less than plot 14. † Produce less than plot 14.

plant much *thicker* on a poor soil than on a rich soil? Certainly, and the reason is, we think, obvious. All alike admit that a free circulation of air is essential to the healthy development of bulbs; but *that* requisite condition may be maintained on a poor soil with plants much closer set than could be on a rich soil, from the greater luxuriance of leaves on the latter. To obtain the greatest produce, however, from a given breadth of any soil, it is necessary to *fill* it, as far as possible, with roots (not bulbs); so that the feeding fibres of one plant, in ramifying in all directions, may overlap and intertwine those of its neighbours, and thus, by penetrating almost every part of the soil, assimilate the maximum of its available nutriment. We can see no analogy in the comparison of a supporter of the Professor's theory, that "a black-faced wether on a Highland hill requires greater space than a cottswold on a Lincoln fen, therefore," &c. This analogy presupposes a hypothesis which we think untenable, viz., that plants on a poor soil throw out a greater number of feeding fibres than they do on a rich soil; in other words, that, like the black-faced wether, they travel farther for their food. The power of locomotion of plants is very different from that of animals. Independently, however, of these considerations, it should ever be borne in mind that the mangold crop is in most instances grown as a fallow crop, and the cleaning and aërating the soil are of as much importance as a heavy crop. The drills should therefore be made, irrespective of produce, at least wide enough to admit of the free use of the horse-hoe and other implements of drill husbandry. 27 inches is a very common and a very convenient distance, but even 30 inches may not be too far apart for the free circulation of air on a rich soil in a good climate. For Scotland we think 24 inches to 27 inches, even in the best districts, is sufficient. Where 20 tons per acre is the maximum produce, drills 24 inches, and bulbs 10 inches apart, give ample room.

Manures.—Last year (1862) we made some experiments with manures for the mangold crop. Four acres, as nearly uniform as possible, were selected from our mangold break, consisting of 12 acres. The drills were run across the line of the old ridges, so that, in the event of their having been differently treated at any time, all the plots would share alike. The farmyard manure was that set apart from 16 highly-fed milch cows, was thoroughly mixed, and carefully measured. The auxiliary manures were weighed, first for each plot, and then for each drill. One set was made at one end of the field, and a duplicate at the other, and the whole crop was weighed. The results are found in Table II., pp. 150, 151.

A sample of the soil was found to contain :—

Insoluble inorganic matter (sulphides and chlorides, alkalies and alkaline earths),	1·64
Soluble organic matter (apocrenic and crenic acids),	1·36
Insoluble organic matter,	137·14
Silicious sand,	754·75
Fine clay,	105·11
	1000·00

Acids of humus,	2·32.	Lime,	55·9
Phosphoric acid,	traces.	Oxides of iron,	38·7

A sample of the Peruvian guano contained nearly 18 per cent. of ammonia and 22 of guano phosphates. The superphosphate shows 26 per cent. soluble phosphate, and 3 per cent. insoluble. The nitrate of soda contained 15·7 per cent. nitrogen = 18 per cent. ammonia.

The altitude is 110 feet, and the distance from the sea six miles.

	The Rainfall was in 1862.			Average of last 12 years.		
Month.	In. dec.	Dry Days.	Wet Days.*	In. dec.	Dry Days.	Wet Days.*
May, . .	4·93	13	18	2·81	17	14
June, . .	3·12	9	21	3·66	11¾	18¼
July, . .	5·55	9	22	3·98	13	18
August, .	4·81	16	15	5·55	13½	17½
Sept., .	2·49	18	12	3·22	14¼	15¾
October, .	8·18	7	24	5.66	11½	19½
Total,	29·08	72	112	24·88	81	103

We leave our reader to draw his own inferences from these results.

Sowing.—The end of April or beginning of May seems to be the best and most generally adopted time for sowing. It is a safe practice to purchase the seed early in the season, and to germinate say 50 or 100 seeds in a little wooden box, saucer, or whatever may be at hand, as severe losses have frequently occurred from using bad seed. A more common source of disappointment is sowing too deeply; half an inch is sufficient. The usual quantity sown varies from 4 to 8 lbs. per acre, depending to some extent on the climate, distance apart of drills, and particularly on the state of the soil. The common turnip-

* A *wet* day is one on which at least ·01 of an inch falls.

sowing machine, with holes made large enough for mangold seed, is commonly used for sowing.

It is a great matter to bring mangolds early "to the hoe;" but if sown too early they either do not germinate, frost kills them, or they run to seed. By *steeping the seed*, either in water or in damp sand, several days are generally gained. In sowing steeped seed care must be taken to secure a moist seed bed, for should it be checked by drought after germination its vitality is easily destroyed. From that circumstance many farmers do not attempt this practice; but with ordinary care, and sowing immediately after the drills are formed, little fear need be entertained regarding its safety. Mr Mechi writes me:—"Our climate is too dry for swedes; I steep my mangold seed in damp sand for ten days previous to sowing, until it spears a little, and I never miss a plant."

Summer Cultivation.—Like the swede, the mangold should be carefully and perseveringly weeded during the whole summer. The younger the weeds are taken, the less expense will be required to keep the land clean. It is surely a mistaken notion to suppose, that by letting the weeds come to size less expense will be required, because they would not require to be weeded so often. Much longer time is required for a seed such as the black mustard, for example, to become a plant with leaves 2 to 3 inches long, than for a plant of that size to become one four times as large; but every weeder knows she can get over the ground twice as quick with weeds of the former size as with those of the latter; so where is the saving? Besides, weeds pulled in the former stage entirely disappear in a day or two, while those pulled in the latter stage often lie in the drills for weeks; it is no uncommon sight to see them clogging, like hay, on the drill harrow or grubber, and mutilating the leaves of the growing crop. Another argument might be adduced—the young weed, in its growth from the state of seed until it becomes a plant having leaves 2 to 3 inches long, takes very little nutriment from the soil, but in its growth from that size till it becomes a plant four times as large, it commits wholesale robbery, at a time, too, when it should be remembered it is very important to have as much available nutriment in the immediate vicinity of the plant we wish to cultivate as possible.

When the largest leaf of the mangolds is about 3 inches long, the plants should be thinned out to the distance apart fixed upon, leaving say two, or at most three, plants in each clump; they may then stand for a considerable time without injury, till a favourable opportunity presents itself for singling and transplanting, and even until most of those which will run to seed are showing signs of so doing, and can, accordingly, be pulled.

Transplanting should be committed to the care of well-tried hands only, and should be done when the barometer is falling, or

when there are signs of approaching rain, if possible. It is better to transplant when the ground is dry, or only slightly moist, than when it is wet. Should they require to be watered afterwards, one good soaking is much better than small quantities applied often. We made some experiments in 1861 on transplanting mangolds, in order to see whether there was anything in the prejudices of some of our women who undertake our transplanting annually. Each lot consisted of twenty plants. We abstract the following from a considerable number.

TABLE III.—Experiments on the Transplanting of Mangold Wurzel, 1861.

Plot.	Transplanted 2d July 1861.	Observations on 2d August 1861.
31.	Planted deep, half-way up the leaves.	Came away without backset, but does not look healthy.
32.	Planted shallow, half the root bare, and lying flat.	Despaired of at first, now looking fresh, but far behind; two died.
33.	Large plants, thought likely to run to seed.	By far the best plants; not one run to seed; fresh and healthy.
34.	Do., took 1½ in. off end of tap-root (to prevent seeding!)	Next best to plot 33; none run to seed.
35.	1½ in. taken off tips of leaves.	Came slow; the old leaves died, and new ones were put forth.
36.	1½ in. off tap-root.	Much better than 35; but not so good as 39 (planted entire).
38.	Tap-root turned up in the hole.	Twelve died; rest looking fair.
41.	Plant laid down, and taproot pushed in by forefinger.	Not so well as 39 (planted with dibble).
87.	Put in loosely with a spade.	Two died; rest far behind (moist weather kept them alive).

On taking up these roots at the end of the season they were found to be, in general, considerably more "fangy" and difficult to clean than those not transplanted at all.

Mangolds being deep rooted, should be grubbed as deeply as possible, at least once, say shortly after singling. We rather avoid *deep* grubbing afterwards, from an idea that it injures the rootlets, which, on examination, will be found ramifying through the friable mould produced by the first deep grubbing. The Norwegian harrow, made suitable for drills, is an excellent implement for breaking rough ground and separating the adhering earth from the roots of weeds; we believe we were the first to have it so adapted.

Running to Seed.—Many hypotheses exist regarding the cause of mangolds running to seed. Some ascribe it to their being checked by frost in the earliest stages of growth; and they adduce, in support of this view, the fact of mangolds running to seed much more readily in Scotland than in England. They aver, too, that early sown mangolds suffer, in this re-

spect, more than those later sown. But spring frosts are generally more severe in the eastern counties of England than in the south-western of Scotland. There is this difference, however, the frosts of the former district are generally accompanied with dry weather; while in the latter, they not unfrequently take place in moist weather; and we have more than once noticed that frost accompanied with moisture usually stimulates the young hay and pastures to form the seed-stalk, while frost in dry weather has no such effect. An idea prevails that it originates in the seed, from the fact of two plots growing side by side, treated alike in all respects, and sown at the same time with the same variety of seed, but *from different stocks*, yet the one having many more run to seed than the other. The practice, too often resorted to, of growing seed from bulbs sown in the autumn of the preceding year instead of from full grown bulbs —mangold being a biennial—appears a sufficient predisposing cause to account for it being sometimes the fault of the seed. It is thought by some to be caused chiefly by the use of powerful auxiliary manures. The "shot" column in Table II. (see pp. 150–51), shows that the percentage "shot," or run to seed, corresponds very closely with the weight of the crop, and, therefore, with the most "powerful manures;" but the larger crops being more matured, perhaps, than the others, may possibly account for this result. Some people cut off the tops of those which have "sprung;" this plan may alter the appearance of the plant, but does not affect its constitution. The better way is to pull them and boil them for cattle food; they are well relished in this young state. At all events, they should never be stored. The following experiment shows that they rot much more readily than those not run to seed :—

Lots.	Shot?	Put up 26th Oct.	Weighed on 23d January.						And again on 3rd June.					Total Loss.			
		Bulbs.	Weight.	(Sound) Bulbs.	Rotten.		Weight.	Loss.	= per cent.	(Sound) Bulbs.	Rotten.		Weight.	Loss.	= per cent.	Bulbs.		Weight.	
					No.	= per cent.					No.	= per cent.				No.	Per cent.	Lbs.	= per cent.
			lbs.				lbs.	lbs.					lbs.	lbs.					
1	Yes.	542	791	523	19	3·51	737	54	6·83	413	110	21·03	614	123	16·69	129	23·80	177	22·38
2	No.	586	889	586	0	...	798	91	10·24	583	3	0·51	728	70	8·77	3	0·51	161	18·11

Both lots were taken from the same plot of ground. It will be seen that lot 2 diminished in weight, during the first stage, and in greater proportion throughout, considerably more than lot 1, notwithstanding the number of rotten bulbs in lot 1. This, we presume, arises from the greater succulence of those not run to seed.

Leaves.—The leaves are, by analysis, shown to be, weight for weight, considerably more nutritious than the bulbs. It may be taken for granted that so long as the leaves adhere to the plant they are of service to it. It has been ascertained that in decaying they yield to the bulb much nutriment. Drs Wolff and Buckman have shown that mangolds, when denuded of their larger leaves in September and October, are not only diminished one-fifth in weight per acre, but are considerably deficient in both saccharine and protein compounds. After the introduction of mangolds into this country, it was customary to strip off the leaves in the end of the season. The injurious effects of such treatment doubtless accounts for the small breadth grown so long as this practice was continued.

Pulling and Storing.—Mangolds are nearly as easily injured by frost as potatoes, and should be taken up in the end of October in Scotland, and beginning of November in England. The desideratum in pulling is to clean off all the earth without injuring the skin, and to cut off all the leaves without injuring the head of the bulb. They will keep well enough without taking off any of the adhering earth; but extra cartage is required, they are much more difficult to clean afterwards, and fibres and leaves are thrown out more readily in spring. If the skin is broken, or the head of the bulb wounded, they "bleed" and mould in keeping, or sometimes take a sort of dry rot. If many of the leaves are left on, they ferment and rot. Mangolds may be very conveniently stored in a house or shed; almost any quantity can be kept together. When very large quantities are put together under cover they are apt to get rather dry, however, and to weigh much lighter in spring. If they be stored out of doors, a situation well protected from north and north-east winds should be chosen if possible. They may be packed up against a wall, or built in roof-shaped heaps, either with or without hurdles. The larger the size of the pits, the less straw, &c., and work will be required to cover any given quantity. A thin layer of drawn straw is spread evenly over the bulbs, then about 6 inches of earth firmly beat, and over all a coating of thatch. A gutter is made round the pit when necessary.

Keeping property.—So superior is this property of mangolds, that they may be kept perfectly fresh all the year round. Indeed, their chief value, in Scotland at least, consists in their ability to furnish a supply of green food in spring after swedes are stale, and before pastures are ready for stock.

TABLE IV.—Result of Experiments on the Keeping Properties of Differently Manured and Different Varieties of Mangold.

Lots	Variety.	Manure per Acre.	Weight when put up.	Weight on 21st April.	Loss of weight.	No. rotten	No. shot of rotten
			cwts. qrs. lbs.	cwts. qrs. lbs.	cwts. qrs. lbs.		
1	Long red	10 cwt. Pr. guano, and 2 cwt. salt	13 0 14	12 0 7	1 0 7	14	12
2	„	10 cwt. superphos. and 2 cwt. salt	14 2 0	12 2 14	1 3 14	10	8
3	„	No manure	14 3 0	12 1 14	2 1 14	11	8
4	„	25 yds. cow dung	13 1 14	11 0 21	2 0 21	12	11
5	„	6 cwt. salt, and 25 yards cow dung	14 0 14	13 1 0	0 3 14	9	9
6	Yel. globe	No manure	0 0 112	0 0 110	0 0 2	none.	none.
7	Long red	„	0 0 112	Eaten by worms	...	„	„
8	Red olive	„	0 0 112	0 0 112	...	„	„
9	Long yel.	„	0 0 112	0 0 105	0 0 7	„	„
10	Red globe	„	0 0 112	Eaten by worms	...	„	„
11	Oxhorn	„	0 0 112	0 0 106	0 0 6	„	„

Feeding value.—They should not be given *raw* before January, as they contain a quantity of pectic acid which causes scouring, and even abortion sometimes it is said. In keeping this substance is converted into sugar in the same manner that the pectine of sour apples becomes sugar in the process of ripening. They may be given boiled or steamed, however, as in that state they are innocuous. In the absence of other experiments on the comparative feeding values of mangolds and swedes, we have recourse to Lord Spencer's often quoted one. His lordship put up two cows, as nearly equal in age and weight as possible, and fed for one month, the one with mangolds, and the other with swedes, hay to both *ad lib.* The following month the diet was changed, the one from swedes to mangolds, the other from mangolds to swedes, and the third month both fed on mangolds. It appeared *by measurement* that the greatest increase in weight of both animals took place while they fed on mangolds.* The following experiment was made at the Albert Agricultural Institution in Ireland:—

* "Journal of Royal Society," vol. ii. For other experiments, see "Royal Society's Journal," vols. iv. and xiii., the results of which are slightly in favour of swedes. We have since made some experiments, 1864 and 1865, on this subject, which resulted rather in favour of swedes. See "Highland Society's Transactions, 1868."

Date.	No. of Cows.	Allowance of Food per Cow.	Milk given.	Total Milk.	Increase.	Daily Increase.
Feb. 15	23	6½ stones swedes, oatstraw *ad lib.*	28½ gals.	57½ gals.	5½ gals.	2¾ gals.
„ 16	23	Ditto.	29 „			
„ 26	23	6½ stones mangolds, oatstraw *ad lib.*	31 „	63 gals.		
„ 27	23	Ditto.	32 „			

The cows had been fed on the swede diet for a fortnight previous to February 15th, and were changed to the mangold diet as soon as the milk was taken on the 16th. Mr Tynan adds—"As fully three-fourths of the cows were in calf, they were naturally decreasing in yield."

We are not prepared to ask our reader to place much reliance on either of the above results; and, without detracting from the value of the experiments, or the merit of the experimenters, we think proper to draw his attention to possible sources of inaccuracy. In the first, the cattle were not weighed, but *measured*, nor was the quantity of fodder consumed noted. In the second, the increase or decrease in the weight of the cows was not ascertained; fodder was given *ad libitum*. No notice was taken of the quality of the milk; and, above all, no division of the cows was made, so as to have one lot on swedes while the other fed on mangolds. Every dairyman knows how the weather affects the yield of milk, and 2¾ gallons on the milkings of twenty-three cows might well have been effected by this cause alone. The results are, however, quite in accordance with what might be judged *à priori* from the comparative analysis of these roots.

Constituents of	Mangolds.		Swedes.	
	Nat. state.	Dried.	Nat. state.	Dried.
Water, . . .	86·040		89·260	
Flesh formers, .	1·810	13·030	1·443	13·662
Fat producers, .	11·190	80·040	8·474	80·288
Ash, ...	·960	6·930	·623	5·910
	100·000	100·000	100·000	100·000

(Dr Voelcker in "Morton's Cyclopedia.")

Notwithstanding the many advantages of mangolds, we think its acreage, compared with swedes, will always be limited in Scotland; the climate is so peculiarly adapted for the swede, while it is too cold for the equally successful culture of the mangold.

REPORT ON THE AGRICULTURE OF PERTHSHIRE.

By John Dickson, W.S., Greenbank, Perth.

[*Premium—Thirty Sovereigns.*]

Perthshire has been called the Yorkshire of Scotland; and if great extent, central position, diversity of soil, and variety in the characteristics and configuration of the county, and the existence of a large body of influential resident proprietary, are the distinguishing features of Yorkshire, the suggestion of a corresponding position for Perthshire, in Scotland, is not without foundation.

It contains 1,596,160 imperial acres, and extends in length from east to west 67½ miles, and in breadth from north to south 61½ miles. Its rental by the last valuation is L.777,294; and though the per acreage rental of some other counties in Scotland is higher, that circumstance is attributable to their mineral and manufacturing wealth, for no county in Scotland, with the exception of Aberdeen, yields so large a purely agricultural rental as Perthshire. There is no coal in the county north of the Ochils, and the only limestone within its bounds is found in the far Highlands to the north of Ben-y-Vrachie, in Glen Goulandie, and in the mountain ranges surrounding Lochs Rannoch, Tay, and Earn, places where, hitherto at least, it has been of no commercial use or value, except for enriching the pasture of a few spots in their immediate neighbourhood. Neither is the richness of its foliage marred by hot-blast furnaces, for blackband ironstone is unknown within its borders. The shaft of a steam-engine is here and there visible, but in most cases they are attached to thrashing mills on large farms, and to thriving bleach-fields of old standing, within a few miles of Perth on the Tay and the Almond. The county, from these causes, forms a great contrast to its next neighbour, the kingdom of Fife, teeming with treasures and industries, which, while they augment its wealth, do not enhance its natural beauties.

From some, or all of these causes combined, there has been much competition for property in the county, and the price of land is, consequently, as a general rule, very high,—many estates having been sold at prices 50 per cent. higher than they would have realised in other counties in Scotland, when the intrinsic value, or value estimated by produce instead of by rental in both cases, is taken into consideration.

The principal part of the arable land of Perthshire lies on the east side of the county. The climate is comparatively dry in these districts, as it is well known that the humidity of the climate of Scotland decreases, and its rainfall rapidly diminishes, as we leave the west coast and approach the east; and it is equally

well known that the quality of the grain is greatly influenced by the dryness or humidity of the climate in which it is grown; in proof of all which we need only refer to the yearly fiars, which rise from Wigtownshire eastward till they attain their maximum in East Lothian and the other counties on the shores of the German Ocean. The soil, also, of a great part of Perthshire is naturally dry, sharp, and fertile, and was capable of profitable cultivation before thorough drainage was dreamt of; and these two circumstances, viz., the hygrometric position of the county and the quality of the soil, pointed it out as a grain growing county, when grain was more the staple agricultural produce of the country, and land that would grow it was scarce, and when both cattle and sheep were greatly less valuable than at present, and so much of the rest of Scotland was capable of producing nothing else. The Perthshire idea was, therefore, the successful growth of grain; land that would grow a "a true boll" was the Goshen of a Perthshire farmer; and although now "good grass land" is more frequently spoken of with favour, it is quite a modern notion, not older certainly than the railroads. So long as land was farmed for the production of grain only, when plough and sow was the rule, as it was much too long the rule in Perthshire, a farm could be stocked with very little capital, compared with what is required where a proper stock of cattle and sheep is kept; and if a man could buy one, two, or three pairs of horses, and implements in proportion, with seed to sow the first crop, and offer some sort of security to the landlord that he would do so much and pay the first year's rent, there was nothing to prevent him with these limited means from starting in a Perthshire farm; and many a man with good luck and fair weather at starting, that is to say, with good seasons and good crops, combined with good prices, has pulled through wonderfully in the times that are gone. To increase the facility for men of small capital taking farms, the terms of payment of rent in the best districts of Perthshire are postponed to Candlemas and Whitsunday, or Candlemas and Lammas, or Whitsunday as the sole term, all after reaping the crop, so that there is ample time for realising the value of the produce before the payments of rent, wages, and the current expenses of the first year fall due.

It is not difficult, however, to understand, that where the entry to land is so easy as regards the amount of capital required for the undertaking, there have always been a number of people who considered themselves able for every farm that has been advertised. An old foreman on a farm, who may have saved a little money, thinks he can take a holding requiring a pair or perhaps two pairs of horses; or a tenant leaves his farm,—leaves it, probably, for one of two reasons, either that he is ruined, or has pulled

through the lease with a hundred pounds or two in hand, and is not content to go on and do better where he has prospered already, but must have a farm of twice the size; or perhaps he keeps the small one and takes another as big. The same ruinous system of large land holding, with inadequate means, prevailed very generally on all sizes of farms, and as the demand for farms was generally greater than the supply, the inevitable result was high rents in Perthshire, as compared with the rest of Scotland, before they received the shock of the abolition of the corn laws. And although at that time the land was badly farmed, and often in an exhausted state, rents did not fall in proportion; and so long as the price of grain kept up during the Peninsular war, rents were maintained at very high rates. Since that period, however, with the exception of the three years' endurance of the Russian war, the times have not been prosperous for either proprietors or tenants. When the price of grain fell after the close of the war in 1815, it was impossible for tenants to pay money rents computed on an expectation of 80s. per quarter for wheat, with barley and oats proportionally high; and to meet the emergency a system of grain rents was introduced, the tenant paying a fixed quantity of grain, converted yearly into money according to the fiars of the county for the year. As we have twice within the last twenty years seen the fiars prices of the triple boll of wheat, barley, and oats reach four guineas, and twice within the same period seen them fall to nearly forty shillings, it will be readily understood that this system produced great fluctuation in rents, and whilst it afforded a certain relief to tenants, it has been productive of a rather uncomfortable state of things to proprietors, as an average rental of L.3000, while it has risen to L.4000, has also fallen to L.2000.

During the last ten years the hopes of farmers, and still more of people who were not farmers, have been excited by a revival in the prices of grain, potatoes, stock, and all other farm produce, and at the same time by agriculture becoming fashionable among all grades of society, and land being for several years in greater demand than ever; but the bad season of 1862, coupled with a low range of prices for grain, have again caused a depression, and land can now be taken at a lower rate than in 1862. The system, therefore, that has been pursued in Perthshire, is one more for the encouragement of industry than for inducing men of capital to embark in farming, and the result is that a large proportion of the farmers who had barely capital for their farms during the prevalence of the old grain growing idea, have never had capital at all equal to the advanced requirements of the present day, when L.10 per imperial acre is a moderate estimate. Moreover, several of the seasons subsequent to 1862 have been most disastrous to the grain growing farmer; his capital has been

seriously diminished in consequence, and precisely at the time when he required double the capital he ever possessed to enable him to take from stock the profits which he formerly took from corn. No doubt, there are farmers possessed of large capital in Perthshire, and of fortunes greatly exceeding the sums invested in their farms, but they are the exceptions. There are large farms in Perthshire, but Perthshire is by no means a county of large farms or large farmers. This remark had still greater truth in the last generation, the size of farms having since then been much increased by joining small possessions together. Two causes have contributed to the enlargement of farms—First, the more substantial and expensive buildings which are required in the present day for small farms. A small tenant, paying from L.50 to L.100, must have a house and steading as complete and substantial of its size as a tenant paying L.1000; but as the expense of putting up dwelling-houses and steadings for ten farms, each of L.100 rent, is much greater than the cost of erecting similar buildings for one farm of L.1000 rent, there is a general attempt to save building by amalgamation. Secondly, the other consideration which has led to the enlargement of farms, and which applies to the pendicles and crofts, is that hand-loom weaving, which chiefly employed and maintained the families on these pendicles, and left all the produce, after paying expenses, as rent for the land, has failed as a lucrative branch of industry, and the produce, which formerly went for rent, has now to support the occupant and his family. But in addition to this, it is manifest that all the parts of a proper system of mixed husbandry of grain growing and cattle feeding cannot be advantageously carried on upon a very small scale. While, therefore, the old farms of moderate size in Perthshire remain very much in *statu quo*, there is a general inclination to raise the smaller farms up to a size equal to keeping three pairs of horses, or, at all events, to give a tenant as much land as would have been wrought with three or four pairs of horses twenty years ago, leaving him to increase the proportion of pasture, and reduce the force of men and horses according to his own views.

Having made these general remarks on the past and present condition of land occupancy in Perthshire, which apply more or less to all parts of the county and to all the varieties of land, it may now be advisable to consider the subject under three subdivisions or classes; and the classes into which they seem to divide themselves are—

1. *Hill grazings and pasture lands*, in which a great breadth of land that has been and is at present under arable cultivation may be included.

2. *Light or easy lands*, which are suitable for the growth of oats and barley, turnips, potatoes, and grass.

3. *Clay and carse land,* being the wheat and bean lands of the county.

There is a considerable extent of the best land in the county that may be placed in either of the last two divisions, being suitable for and capable of growing any kind of crop, having all the advantages of both without the disadvantages of either. The black land in the Carse of Gowrie is wrought with the ease of turnip land. It dries rapidly, does not suffer from drought, and while it grows as good wheat, beans, clover, and tares as the best clay lands, it also produces as heavy crops of turnips and potatoes as any land in the country, and when laid down to permanent pasture it equals any land in Scotland for feeding. From its quality this black land in the Carse of Gowrie should be considered with the lighter lands, as being the best class of such soils, but from its locality and production it is more convenient to consider it with the Carse lands.

While, however, the lands of the county may be properly divided into these three great classes, it must not be supposed that every farm within each class is worked in the same way, as there are infinite varieties of management; but this diversity of practice arises not so much from difference in the rotations of cropping, and crops grown on the various classes of land, as from the mode of disposal and application of the crops produced. The leases under which land is held seldom attempt to regulate the disposal of the produce; for while on the light lands they provide for a five, and on the Carse or clay lands for a six or seven shift, they have never done much towards providing for the proper use of the crops grown, or considered that part of the subject as having as much to do with the condition of the land as the rotation of the crops grown from it. Most leases have carefully and painfully prohibited the growth of two white or corn crops in succession, and prohibited the disposal of straw—both very good stipulations so far as they go—but no provision is made for the grass that intervenes between two white crops being used in a manner that will tend to restore the land; and as the sale of hay is usually authorised and provided for, hay being quite as exhaustive of the land as any grain crop, it may be fairly said that these leases, while prohibiting two white crops in succession, are in truth permitting three to follow each other. And while it is provided that the straw shall be kept on the farm, no provision is made for its receiving those enriching matters from the consumption of other crops and substances, which alone can make it of value as manure in maintaining or improving the condition of the soil to which it is applied in compensation for what is sold off and lost to the land. It is from the latitude allowed to farmers on these points in their leases that the great difference in their practice arises; and while many, from old-

fashioned ideas, want of skill, and want of money, avail themselves to the utmost of the abstracting and selling off powers contained in their leases, others who know that the direct profits from stock sold, and the indirect profits from the improved condition of their farms, by the feeding of such stock, are infinitely greater than any that can be obtained by growing hay and potatoes, not for feeding but for sale, manage their farms accordingly, and thrive upon them. The different degrees of good farming in each class are marked by the extent to which the tenants have left the first mode of practice just indicated, and approached to or entirely adopted the other. The farming in Perthshire, in both classes of arable land, is at present in a transition state from pure grain, potato, and hay growing, to a proper combination of grain growing, with a due proportion of turnips, pasture, and soiling grass for raising and keeping a stock of cattle and sheep; and while such transition has during the last ten years made very great and marked progress in the lighter lands of the county, it has not made the same advance in the Carse districts.

To proceed, however, with the consideration of the three classes of land in the order in which they have been put down, we shall take up—

1. *Hill Pasture.*

It must not be supposed that this class of land in Perthshire is at all equal to the grazings in the south of Scotland or in Sutherland. The scenery in Perthshire is too fine, and the bags of grouse made on the 12th of August too heavy, to expect such to be the case. But while the rugged grandeur of the generality of the mountains of Perthshire does not present to the shepherd's eyes those green hirsels of less pretentious form so common in the south of Scotland, there are, nevertheless, in various parts of Perthshire large sheep grazings of a very superior description for blackfaced sheep, which, from the system of breeding with Leicester tups and growing cross-bred lambs, are paying the occupants proportionally as well as grazings of a higher class. Besides those Highland grazings in the Grampian range, are the sheep farms of the Ochils in the south of the county, which resemble the hills in the south of Scotland more than those in the north of Perthshire; these contain, on both their northern and southern slopes, and in the recesses and glens by which they are intersected, many grazings of good quality. In these uplands the land is in many parts too much subdivided, and too much cropped; small farms—each with all the paraphernalia of houses, steading, &c., erected originally at no little cost to the proprietor, and adapted to arable farming—are much too numerous in these districts, where the altitude of the land and the quality of the soil are most unsuitable for constant cropping; and when we add

to these disadvantages the present high and increasing price of labour, it is impossible to resist the conclusion that these high lands cannot long be kept in cultivation, and yield a rent to the proprietor and living to the tenant such as can be realised from them if properly laid down to pasture; and that some such re-appropriation of this class of small farms is inevitable at no distant time, the outlay in buildings for arable culture notwithstanding, seems more than probable. This has taken place during the last fifty years in some parts of the south of Scotland, where the holdings were more moorland farms under mixed husbandry than large stock farms. The traces of cultivation on the hill sides, and the ruins of old crofter huts and hamlets, now numbered among the things that were, are still observable in many parts of these southern uplands. All agriculture in the present day on high altitudes must be regarded as only a means to an end, that end being grass; and when the end is attained, sheep must take the place of men, women, and horses, since it is found that their labours can be turned to better account in localities at a lower level. Land of this sort, if laid down to grass, with no annual expense in its management but the wages of a shepherd, may pay rent to the landlord and a profit to the tenant; but if kept under the plough, there can be no prospect of great profit, even in favourable seasons, and a chance of there being little beyond payment of expenses in unpropitious years.

With regard to the large grazings in the Highlands and mountains of Perthshire, much improvement has taken place, both in the lands themselves and the stock that is produced on them. A great extent of surface drainage has been executed, with the sure result of improving the quality and soundness of the pasture, and thereby the stock fed upon it. With the exception of the winters 1859–60 and 1864–65, the recent seasons have generally been of a mild character, and favourable for the sheep stocks; but in occasional years, such as 1859, the hill graziers have suffered heavy losses from deaths of stock and the expense of supplying food at high prices to the survivors, having no preparation for such contingencies within themselves. They might protect themselves in many cases from such disasters by forming water meadows on suitable spots on their farms, and raising yearly a crop of hay, which, if not required in open seasons, would accumulate for those in which it was needed. There is not a water meadow in Perthshire except a small one at Glendevon; but those who wish to see them, and learn the advantage derived from them, will find them in Peeblesshire and the upper ward of Lanarkshire, in a higher and colder climate than most of the grazing lands of Perthshire.

Where ewe stocks are kept the blackfaced breed are still

maintained, and when the altitude and quality of the grazings are considered, they are the best and hardiest breed for the purpose. Twenty years ago, all these farms bred only pure blackfaced lambs, and the only cross-bred lambs then produced were got from the old ewes of these farms after being sold to the low county farmers and served with Leicester tups; but of late years, in many cases, in consequence of the advance in the price of wool, the young ewes are crossed with Leicester tups, and cross-bred lambs got from them yearly. This, of course, necessitates the purchase by such farmers of pure blackfaced ewe lambs from other farms, which accounts for the advance in price of that stock, as well as of the better classes of sheep.

The rents of all sheep grazings in Perthshire that have come out of lease during the last ten years have advanced greatly; but, nevertheless, the present occupants have been making much more profit from them than their predecessors did at lower rents. It could not be otherwise, when the price of mutton has risen 50 per cent. and the price of wool 150 per cent. We may, therefore, close these remarks on the *hill lands* with a hope that something like the recent times and prices may be vouchsafed to them; and although these prices should go back considerably, it would only be a loss in the degree of profit.

The next class of land that claims attention is—

2. *Light Arable Land.*

As already stated, under this head are included all the lighter arable lands not connected with hill grazings.

When the present condition and management of this class of land is compared with what it was thirty years ago, it is evident that generally there has been a very great and marked improvement. This improvement is the result of a very large proportion of these lands having been thoroughly drained; of the erection of large additions to the farm buildings, especially in adding to the accommodation of cattle, and in many instances of entirely new steadings; also, in the erection of fences of various kinds; and in the adoption of a much better system of management by the tenants.

Thirty years ago, and on many farms up to a later date, the rotation of cropping for lands of this class, prescribed by the leases and practised by the tenants, varied little from the rotation in the clay lands as to the proportion under grain crop, except that the wheat crop taken before the barley sown out for grass on the latter was omitted on the light lands. The rotation was —1st, oats; 2d, beans, and latterly a large proportion of this division was potatoes; 3d, wheat; 4th, fallow, latterly turnips; 5th, barley; 6th, grass, cut for hay. It is impossible to conceive

how second-rate land could be maintained in any sort of condition under such a system of cropping, more especially when the grass division was made into hay, the potatoes sent to London, and as little of the produce consumed on the farm, and as much as possible converted into cash by sale. With the exception of farms occupied by enterprising men, who carted dung from Perth and Dundee, or got it by sea from London, or used bones for their turnips, the land was generally in poor condition, always becoming poorer, and the tenants keeping pace with their farms, and going to ruin along with them—in many cases unable to finish their leases without reduction of the rent, and too often not able even with that. What rent the same men would have been able to pay by this time, under the continuance of such a system, it is impossible to say—probably none at all; but fortunately for proprietors in Perthshire, however badly one tenant succeeded in a farm, there have always been abundance of others ready to take it at no great reduction of the rent.

Had, therefore, the farming of these lighter lands in Perthshire remained to the present time as it was, without improvement on the old system, its case would have been poor indeed; but it has wonderfully improved, and we shall now consider the steps and occurrences which have led to its improvement—both what has been done with that view by the proprietors, and also the manner in which the tenants have seconded their efforts. The first in date and in importance was the introduction of tile draining, which before 1847 was executed by the tenants themselves; but the Government loans to proprietors after that date enabled them to relieve the tenants of the expense, and enforced a deeper and more effectual system of drainage. The drainage, after the broken stone epoch, was executed with horse-shoe tiles, and sometimes soles; but it was too shallow, rarely exceeding 2 feet in depth. The drainage executed under loans from Government has been done with pipes and collars, and at greater depth, and it has been found to be both more effectual and permanent. The sum spent on drainage in the county has been fully in proportion to the other counties in Scotland of similar quality of land.

Besides the thorough drainage of the greater part of the arable lands of the county, a great work in the way of arterial drainage was executed about fifteen years ago. The pow of Inchaffry, running to the Earn from the west end of a large peat morass situated south of the village of Methven, through the estates of Bachilton, Balgowan, Gorthy, Abercairny, and others, was deepened and straightened, at the expense of L.15,000, under an Act of Parliament obtained for the purpose, and the improvement on the district has fully warranted the expenditure. The arterial drainage in the Carse of Gowrie has also been improved by a similar process, but on a less scale. The "Pows" in that district

are susceptible of further improvement, and the thorough drainage cannot be complete or permanent until they are deepened to a greater extent.

Next in importance have been the additions to the farm steadings, on which large sums have been expended. They were rendered necessary by the greater quantity of stock both wintered and fed, and the progress in the ideas of farmers as to what was required in the way of houses in order to do their stock justice. The landlords have responded to this demand. They saw the necessity; that their own interest was involved in meeting it; and that by supplying their tenants with the means of feeding stock and of keeping the produce on the farm, the condition of the land would be maintained and improved. This accommodation for cattle has been given in different ways, by feeding byres and by sheds with open courts for wintering younger cattle, and also latterly by covered courts, which can be used either for wintering cattle or by subdivisions as boxes for feeding. There can be no doubt that these covered courts have considerable advantages. They are the cheapest mode of getting a covered area applicable to the keeping of any kind of stock, whether cattle, horses, sheep, or pigs; and if made on a proper plan, without too great draught of air, they afford a well-ventilated and lighted shed for cattle, contributing to their health and progress, while the manure made in them is saturated only with animal liquid, and protected from rain, which would wash away the more valuable ingredients. They certainly in this respect offer a great encouragement to the high feeder, who calculates for repayment of a part of the oilcake in the dung, that it shall not be washed down to the nearest burn; and these reasons must have had their weight, from the number of such covered courts that have been lately erected. It has been objected to them, that cattle do not get the sun heat and light as when kept in open sheds; but if there is any force in this objection, it can be remedied by having a small part uncovered on the south side; and some have been put up on this plan. The feeding byres for cattle have also been greatly improved, both as regards the number of cattle that can be accommodated and the space for each, with better ventilation. Another great improvement is the erection of straw barns or sheds for keeping the thrashed straw protected from the weather. Good sweet, dry straw contributes to the success of feeding and wintering cattle as much as turnips or any other food, and much loss was sustained by the damage it received from exposure before such expedients for its preservation were adopted. Besides these buildings, all recently erected or improved, steadings are supplied with turnip houses, implement sheds, and other necessary accommodation; and the proper arrangement and combination of all these houses are well understood and applied in practice. The

thrashing-mill is regarded as the heart of the steading, and the straw as the blood to be diffused without interruption or exposure to the air; and as it is the most bulky material, its easy transmission is of primary importance. The arrangements may be varied, but the general principle as regards the straw is sought to be carried out, and the fatal error of old times of erecting the granary and cart-shed between the barn and stable avoided. On this class of land in Perthshire there is now little to complain of as regards steadings, and it is fully on a par with the best districts elsewhere in proportion to the size of the farms.

During the last twenty years a great deal has been done in fencing. Before that period there were probably fewer fences in the arable lands suited for pasture than in any part of Scotland; and as long as the system of farming that has been described was the rule, there was little necessity for them, for the single year's grass was cut for hay; and if it was kept two years in grass, and grazed during the succeeding year, it was enclosed with temporary paling or flakes for young cattle, or a boy was engaged to herd the stock. When stone must be quarried and carted some distance, a dyke is an expensive fence, and some of the stone in Perthshire is not durable; but where good stone was to be had, there are dykes, or rather walls, not to be surpassed. To hedges also there was the same objection, as they required double palings to protect them when young; and wood is gold in this county. Had no cheaper system of fencing been discovered, it is doubtful whether much progress would yet have been made in that matter. Wire fences, however, were introduced about twenty years ago, and since that time they have been adopted to a great extent. They answer very well for sheep, and also for cattle when a bar of paling is put along the top; and though a good horse now and then gets his legs into them, and is taken out more dead than alive, the trade of erecting wire fences goes on and prospers, and many people have adopted it as a means of living.

Having thus noticed that class of improvements in draining the land and erecting houses and fences, which it is the province of the proprietor to supply to the tenant, it remains to advert to the improvements and changes that have taken place in the farm management by the tenants themselves.

The first step in the right direction for this class of land was the desertion of the six-shift, with three grain crops, to the five-shift, with two white crops, a green crop, and two years of grass, which now may be considered as the prevailing rotation, as none more severe is allowed or practised on lands of this class. Some farmers prolong it by introducing another green crop and grain crop, and some leave the land three years in grass. Before the appearance of the potato disease in 1845 that crop had for many

years been the great prop of the Perthshire farmer. The Perthshire reds were then in their glory; they yielded enormous crops, which made up for low prices, and a great business was carried on in exporting them to London from the port of Perth. The disease, however, altered all this. The Perthshire reds suffered more, and rotted faster than any other kind; and they now hold a position in the vegetable somewhat analogous to the fossil fishes of the old red sandstone in the animal kingdom. Regents and hens' nests became the kinds that were cultivated; but a crop of 20 bolls (the big Perthshire boll, four to the ton) was considered a good crop, while the old reds ranged from 40 to 80 bolls per acre. This diminished production, further reduced in some years by the continuance of the disease, made potatoes an uncertain, and, on the whole, an unremunerative crop, and the attention of farmers was turned to turnips, and stock to eat them. As long as potatoes were the rage, turnips in Perthshire never got fair play; for the best dung, and much the largest proportion, went to the potatoes, and the turnips only got the longer spring-made dung, or none at all; for bones were grudged, and the light manure era had not dawned on the agricultural world. Fifteen tons of turnips were then thought a very fair crop. About this time guano made its appearance from abroad, and gave for the time a great stimulus to agriculture, and probably saved Perthshire for several years, between 1848 and 1853, from a total collapse. Nothing could be blacker than the prospects of the Perthshire farmer at that period; the price of grain ranged between L.2, 2s. 6d. and L.2, 13s. for the triple boll; his old friends the red potatoes gone, and their places supplied by others yielding a niggardly and uncertain crop; while fat cattle only realised 7s. per Dutch stone. At this time many farmers were induced to go more into stock and the growth of turnips instead of potatoes, and all who did so have done well. They were right to desert the potatoes, for they are the sure type of an exhausting style of farming when grown to such an extent as to exclude the possibility of keeping a proper quantity of stock. Potatoes and hay, unless with compensatory application of extra manure, may fairly be styled illegitimate profits; for grain and stock are the only legitimate exports from land.

Those men who had gone into stock farming were agreeably surprised to find the price that they received gradually rising in their favour, and this circumstance induced an extended growth of turnips, and tended to reduce the proportion of the green crop division under potatoes. As a consequence of this change, the manure made was of greater value, and the land was improved in condition, as shown by the crops and grass produced from it. More recently, the enormous advance on the returns from sheep, in both wool and mutton, have led the great bulk of farmers of

this class of land to turn their attention to that branch of stock keeping, and it has done them more good where it has been adopted, both in direct profit to their pockets, and in the less direct but equally important profit of improving their farms, than anything else that has happened during the last twenty years. It had at least one good result, in leading many of them to pasture their young grass, instead of cutting it for hay. Ten years ago there was scarcely a sheep to be seen within ten miles of Perth, except those from the Highlands, sent down for wintering; while now, on farms up to the very suburbs of the town, every farmer must have his proportion of sheep. Some buy lambs, cross-bred, half-bred, or pure, as they can get them, or as the price suits their funds, and sell them fat as hogs; others buy ewes, take a cross of lambs, and fatten them after the lambs are weaned, and sell the lambs fat, or keep them on for hogs. Another indication of the progress of stock growing is afforded in the sale of young short-horn bulls. Ten and fifteen years ago, the few noblemen and gentlemen who had stocks of good blood could not sell the young stock in the county at prices at all in proportion to their value; but now there is a yearly sale of young short-horn bulls, which are bought up by the farmers of the county at from L.20 to L.30; not that the stock to be bred from them is pure short-horn, in all or most cases, but the tenants are aware of the value of a good sire on the quality of calves from cross-bred cows, and are willing to pay something for the advantage. *Breeding,* however, in the better districts had been but little attended to, but it has now begun, in consequence of the difficulty of getting good stock in the markets, and the high prices paid for it. A great deal of the stock grazed and fed in the county has been Irish, and as these have been improving in quality, many farmers have been contented with them. Cattle of pure short-horn breed, or those approaching to pure, have been preferred; but next to them the Ochil doddie (a deep-barrelled animal) is much liked by feeders.

The railways in this county have given, no doubt, a large assistance to agricultural improvement and farming, in the carriage of tiles for draining, lime for the land, and all building materials, also in the transport of fat cattle and sheep, grain and potatoes, to the Edinburgh and Glasgow markets; and these advantages are permanent and progressive in their character.

Guano, and light manures which have been introduced since guano rose in price, have also had their share in pushing forward the improvement of the lighter lands in the county. Where they have been judiciously used, where they have been added as assistants to farm-yard manure for growing turnips, or where applied alone, the turnips have been chiefly eaten off with sheep, the crops grown, and manure made from them, have been greatly

increased, and the condition of the land correspondingly improved. But, on the other hand, wherever these principles have been neglected, wherever these lighter manures have been trusted to supply the place of farm-yard manure, where turnips and potatoes have been grown with them, and carried off, and, at the same time, the grain crops have been stimulated by similar applications, the land has been reduced, instead of improved in condition.

It would be a mistake to suppose that if a change in the relative prices of grain and stock took place, which is very unlikely, at least to the extent of a transposition, that the farmers of the light lands of Perthshire could go back to the system of thirty years ago—pure grain growing. Though grain rose to double its present price, and beef and mutton fell to 7s. per stone, instead of nearly 12s. as at present, they have learned so much to look on stock as a necessary means of keeping up the condition of their farms, that they can never desert it. The large direct profits on stock have induced them to adopt it as a part of their business, but they have, at the same time, come to know that the indirect profit is not to be despised; and if the farmers of this class of land lay out, as they are proposing to do, a greater proportion of their farms in pasture than in the five or seven shift, they will have it in a fit condition for grain cropping, if from some unexpected cause the price of grain should be such as to tempt them. At the same time, it should be remembered that, except for sheep, the duration of the pasture season in Scotland is very short in comparison with Ireland and the south of England. There they have good grass from the 1st of April to 1st January, whereas in Scotland it may be set down as from 1st May to 1st October, nine months against five. The Scotch farmer has thus to feed in the house seven months out of the twelve, and it is difficult to see how he can materially extend his pasture, and reduce his crops that supply winter food, if he is to keep any considerable proportion of cattle. Even with sheep of the fine breeds suited for arable land laid down in pasture, they must have turnips and grain in winter, as there would be little good in the mere foggage of the pasture fields. The causes that induce them to lay down a greater breadth in pasture, besides the high return from stock and the low prices of grain, are the high price of labour, and scarcity of hands, especially day labourers and women, and the trouble of managing farm servants, who know the difficulty experienced in supplying their places. Thirty years ago ploughmen's wages were from L.10 to L.14, with meal and milk, but now they run from L.20 to L.24. Then, again, it is notorious, from the census returns, that the population in rural parishes is, except in villages, gradually being reduced, where the improvement of land and its proper cultivation and cleaning require an increase, and farmers find it difficult to get hands

for out-door labour, such as planting potatoes, gathering the weeds out of the land after harrowing, singling turnips, harvest, and potato-lifting.

The cause of this state of things may be found in men and women now having difficulty in earning a living, when not working on the farms, which they formerly obtained, in hand-loom weaving or needlework of various kinds, now superseded by the power-loom and the sewing-machine. They find that the wages at the factories in Dundee, Perth, Blairgowrie, or in places out of the county, are better and more certain than the hard labour and uncertain wages of out-door work. Emigration also has tended to thin the population, and must do so the more it proceeds, because when people find that they have as many friends and relations in New South Wales or New Zealand as at home, much of the aversion to a new country is removed, and they come to regard it as a new home prepared for them, with better prospects than the old one they are to leave behind. The tendency also on the part of proprietors to endeavour to check the increase of the poor-rates, since the Poor Law of 1845 was passed, by not rebuilding or repairing cottages, has also had its share in contributing to the reduction of the rural population. If thrashing-machines, reapers, horse-rakes, and various other agricultural implements had not been invented, farming operations would long ere this have come to a dead lock. Those proprietors only who farm part of their own estates can be fully aware of the hardship entailed on their tenantry from this cause, and if it continue, landlords will find that a policy which, in the first place, affected the tenants, will ultimately affect themselves, and that they had better have met the obligation imposed on them, than attempt to relieve themselves by extraordinary expedients. In places where there are too many people and too many horses, and the labour of both is misapplied and wasted, they may well be reduced in number; but in those districts where all the present population and more are wanted, it is a great mistake, from a terror of poor-rates, to thin their numbers.

To prevent the further desertion of their native land by the labouring class of this country, it is not too soon that the movement for the improvement of their dwellings, both cottages and bothies, has been originated. The best means for checking the reduction of the necessary rural population, would be by a more general employment of married ploughmen, who would rear families on the farm early accustomed to and suited for farm work. Farmers in the county prefer them, both on this account and because they are steadier than bothy lads; but of course married men with families require cottages, and all farms have not cottages sufficient. To prevent the expense of separate cottages on farms requiring a number of ploughmen, young un-

married men were employed, who were not housed in the farmers' dwelling as in other more primitive districts, but in a separate cottage, too often a sad hovel, where they lived and cooked for themselves in a way that is now better known by the discussions which have taken place on the subject. These have had a good effect in increasing the disposition to employ married men, and to improve the bothies by separate accommodation, and many comforts which neither masters nor men seemed to have considered necessary. The bothy men used to be worse lodged than any animal on the farm, but there has been of late a very general improvement in this respect.

Some of the farmers of the lighter lands in Perthshire who are thriving by stock keeping, try to supplement the want of extent in their farms by taking grass parks in the neighbourhood, and it would appear that the increase and improvement of the pasture on their own farms have by no means diminished their desire to have them. If they have sheep, they graze them at home, and take parks to summer their young cattle; and the more they become stock farmers, the greater becomes the desire to have that which will keep it. The demand for grass parks is consequently great in proportion to the extent at present existing, and the rents are consequently high. Good grass parks fetch a higher rent than the land could bear under an agricultural lease. But except at Balgowan, where there are about 600 acres annually let at a rental approaching L.2000, there has been no great addition to the extent of grass parks in the county for a length of time. Where proprietors have land suitable for grass parks, there is no more profitable application of it, for the expense of building and repairing steadings is saved; and it would be a great boon to the tenantry of the county if good grass could be got at somewhat easier rates, which an extension of the acreage under grass might possibly but not certainly lead to.

Having thus fully considered the history and present state of agriculture in the light lands of Perthshire, the next branch of the subject that claims attention is that of—

3. *The Heavy or Carse Lands.*

These lie chiefly in the Carse of Gowrie, situated on the north bank of the Tay between Perth and Dundee, and in the lower part of Strathearn above and below the Bridge of Earn; they consist of deposits of alluvial clay of comparatively recent formation, occupying naturally the lowest and flattest parts of the districts named, and throughout the Carse of Gowrie they are interspersed by slightly elevated mounds or ridges of an older formation, consisting of dark brown clay-loams of greater fertility, locally called "black land," and which formed islands or "inches" in the flat muddy waste that extended from Kinnoull Hill to

Dundee Law, whilst the clays were in course of slow accumulation. The quality of this heavy land varies greatly, from the finest clay to a poor whitish "end clay," as it is called, which has the double disadvantage of being very difficult and expensive to work, and very uncertain in its produce, both as regards quantity and quality; and not being suited for green crop and grass, it has less chance of improvement, though the deep draining of late years, coupled with a more liberal application of manure and lime, may ultimately improve its condition.

In order to come to a proper consideration of the agriculture of carse land at the present day, and to indicate the direction in which improvement may be hoped for, it is necessary to take a retrospect of the past, and the changes or progress that have been made. It will not be necessary, however, for this purpose, to go to a very distant date. About forty years ago potatoes were first taken to the London market, and up to that date no very great alteration had been made on the mode of farming in the carses for a great length of time. Previous to that date the land had long been worked on the same rotation of crops, the ruling principle being to take as much out of it in the shape of grain crops, and to put as little restorative matter back as would save the land from utter exhaustion. In those days, though the same perfection in implements of husbandry had not been arrived at, the tillage of the land, it is believed, was fully equal to that of the present day; and it seems to be admitted on all hands that the results, in the shape of grain crops, were often, if not generally, superior to ours. How far this inferiority in the present day is attributable to the success of our predecessors, and the system which we have been too ready to follow them in, will be the subject of the following remarks.

Forty years ago the carse rotation on fair clay land was generally a seven-shift, consisting of four grain crops, two of them being wheat, and the intervening *quasi* restorative crops consisted of beans, fallow, and grass, the latter cut for hay, except what was cut green in summer for the horses on the farm; and on the better class of black land a four-course was generally practised, or a five-course, if, after the wheat, barley was taken sown out with grass seeds. In those days there was no guano or nitrate of soda, and perhaps it was all the better for the former occupiers, and for us who have succeeded them, that there were none of these appliances; but worse than that, there was really no good manure made anywhere. The manure of the present day is not all that can be desired, but certainly it must be better than it was in these times, when, in windy weather, it required to be tied to the carts with straw ropes. Then cattle were never regarded as a source of profit, from which any appreciable part of the rent or expenses was to be paid, and scarcely as necessary for maintain-

ing or improving the condition of the land. If the farmer got his straw well wet, it mattered not much to him whether that end was attained by rain from heaven or cattle urine. There was a show of effecting the object by the latter process, for a score or two of cattle were bought at some of the autumn trysts and kept on Bridewell fare—straw and water—all winter, and their temporary proprietor was well satisfied, on parting company with them in spring, if he had a pound a-head from the transaction. He was all that sum to the good, besides the aid they had given to the rainfall, in wetting his straw to a condition that entitled it to be called dung. On a purely clay farm in those days, before tile-draining came into vogue, there was no attempt at growing turnips; and feeding the unfortunate scarecrows of the strawyard with oil-cake, hashed grain, or any modern food now daily given by ordinary farmers, was never thought of. All that went back to the land was straw and water; a part of the straw having been eaten and passed through the animals as dung, and the rest of the straw watered with urine of animals fed on straw and water alone, and perhaps in some measure benefited by its connection with their interiors, but it could not contain any ingredients beyond those supplied by the articles it was produced from. It speaks volumes for the natural fertility of the Carse clay, that it maintained a certain degree of productiveness against such merciless exhaustion from generation to generation; for sure enough, there are few soils that could stand it long without being reduced to absolute sterility. This exhaustion, however, arose not from the frequent repetition of grain crops, but from the total absence of any sufficient means to sustain the land under them; for the intermediate crops intended to be restorative were not worthy of the name, according to the conditions under which they were grown and the purposes to which they were applied. To the four grain crops in the old rotation—oats, wheat after beans, wheat after fallow, and barley after the wheat, sown with grass seeds—there is no objection, provided the barley after wheat is well dunged. Turning to the alternate restorative crops, first, beans, if well manured and drilled, they also cannot be objected to for clay land—they are a crop that is thoroughly ripened on the ground, the seed or grain being carried off the farm and sold, but the straw or haulm is consumed on the farm. In those days, however, beans were sown broadcast, and therefore little could be done in the way of cleaning them; and if dung was applied, which was not the practice, its enriching qualities were but slender. Beans, therefore, whether as regarded the field from which the crop was taken, or the farm generally, were far from having a restorative effect. The next alternate restorative was the fallow. In those days fallow was believed to be, and seems to have been, the keystone of the whole rotation. There can be

no doubt that, in consequence of this strong faith on their part, they bestowed much care in the working of their fallow, and they manured it heavily with such dung as they had, and which has been already described; and they further gave it frequently a good dressing of lime, a practice which, we may observe, has gone sadly out of use in the Carse. For the purpose of growing a good crop of wheat on land in an undrained state, it is hard to say whether a liberal supply of this extremely long undecomposed dung may not have had as good effect as richer and shorter dung. The latter would no doubt have fed the land better, but the long unrotted straw kept the heavy clays opener than the other would have done, and it thereby admitted the heat and air to the roots of the plant. The benefit was more of a mechanical nature to the land than nutritive to the plant. It enabled the land to give off a heavier crop, but did not supply it with much that that crop was to be fed by. Be that as it may, a well-wrought and well-dunged fallow not only got a good crop of wheat, but told on many of the subsequent crops. The last of the series of restorative crops was the grass; and with regard to that, our predecessors had fallen on better times than ours, or their success in growing grass may have operated to our disadvantage; for it is notorious that at that time farmers seldom failed in growing a heavy crop of clover with the ryegrass, and in getting a good second cutting to keep their horses and milk cows after the hay was gone. These rich crops of clover, and the bulbous roots they produced and left in the land, had more to do with maintaining its fertility than all the dung that was applied throughout the rotation. The value of a good crop of clover in the grass has been known at all times, and it has always been regarded as the precursor of good crops throughout the whole rotation that succeeded it. Such being the case, it is difficult to estimate the loss to farmers by the failure of clover, as they lose not only in the weight and value of their hay crop and the aftermath, but in the condition and productive power of the land in the succeeding years. The farmer had no fear of what is now called clover sickness, and he could calculate on an abundant crop of clover with the ryegrass. He cut both for hay, and seems never to have thought that his doing so was exhausting the land to the prejudice of a succeeding generation.

Since that date, forty years ago, potatoes began to be shipped extensively from Scotland to the London market, and the twenty years succeeding were the epoch of the Perthshire reds. They were soon largely grown on the black land of the Carse, and generally throughout the county. It was found, of course, that to grow them successfully, more and better dung was required than the long wetted straw that had hitherto passed under the

name of dung, and supplies were obtained from London, Dundee, Perth, and anywhere they could be got; heavy crops of potatoes were grown, often amounting to from fifty to eighty bolls an acre, and being all driven off the land, took most of the good out of all the dung that was applied to them; and though they may have paid the grower at the time for his expense, and left a handsome immediate profit, the condition of the land over which they were grown was not improved by their introduction.

The next important change in the Carse was the general introduction of tile-draining. As there are no stones to be had in the Carse, no drains of that kind had been attempted; but the clay of the Carse was suited for making drain-tiles, and, when made, they were admirably suited for draining it. Draining in the Carse thus only commenced about thirty years ago, and was carried on with great activity, and was further stimulated by Government loans for drainage, which began in 1846. The greater part of the first drainage was defective in two respects—want of depth and want of soles; but the Government demanded a four feet minimum, and pipes and collars were eventually substituted for horse-shoe tiles with and without flat soles.

The consequences of this general drainage on the Carse farming were important, for it enabled the tenants to grow turnips on land which formerly was quite unsuited for them, and they were substituted for the bare fallow, which up to that time had been considered essential to good farming. Bare fallow could not stand against a crop of turnips worth from L.8 to L.12 per acre; and, besides that advantage in favour of the turnips, it was found that the wheat sown on bare fallow, dunged and drained, was very liable to be thrown out in winter. The consequence of increased crops of turnips was, that the feeding of cattle took the place of the mere wintering on straw and water.

Moreover, about twenty years ago we entered on the epoch of guano, nitrate of soda, sulphate of ammonia, phosphates, and superphosphates. These were found to be important auxiliaries to farm-yard manure in the increased growth of turnips, and necessary to get the weight of grain crop that had been grown twenty years previously, and it was found advisable to give the grain crops and grass assistance from the same stimulating applications. That benefit has been derived from these substances on many farms where liberal applications of more solid manure have also been given, and where a large stock of cattle have been kept, cannot be denied; but in other instances, through their use, a great deal of land is at this moment in a poorer condition than it has ever been since it was created.

Having given the sketch of the past history of Carse farming, can it be said for certain that any great improvement has taken place in it? To judge by the results in the appearance of the

crops for many bears back, it may be said that the improvement is not in the same ratio as it has been on the lighter lands of the county, and while the rent of the latter has increased, on the clays it has stood still or declined. And, if it is admitted that such is the case, it may be asked, Who or what is to blame for it? Is it the management of the present possessors, or is it that of their predecessors, or is it the result of unfavourable seasons, or low prices consequent on the free importation of corn, by which the resources of the tenants for maintaining their land in condition are crippled? The true answer to the query would be, that it is not attributable to any one or two of these causes, but to every one of them, and perhaps in pretty equal proportions. It has been shown that the land has been subjected to heavy grain cropping, both by the present tenants and their predecessors, and that no adequate means have been taken in the management and application of the so-called restorative crops to effect the object for which they were intended.

Twenty years ago there was a general impression that the fertility and productiveness of Carse land was yielding to the treatment it was receiving, and from the idea that this should be remedied by a modification of the proportion of grain grown, the seven-shift was changed into a six-shift, by preventing the tenants from taking wheat and then barley before grass. At the time this was generally supposed by proprietors to be an improvement; but, with all submission, it may be fairly doubted. It would not pay to lose the wheat crop and sow out with barley; so that the result was, that the wheat was kept and the grass was sown in it in spring, instead of with barley, at great disadvantage, after the wheat had been six months in the ground and the surface battered by the winter rains. Every farmer knows that the nearer to the dung the better will the grass be; and under the old seven-shift, as the barley and grass seeds were always dunged, the exhaustion by the grain crop was counteracted, while the chances of a good crop of grass and clover were increased, both from that cause, and in consequence of the grass seeds being sown in spring-wrought land, instead of a bed scratched for them in the battered surface occupied by wheat.

It is needless to enlarge on the other two causes of the present depression of agriculture in the Carse, as they are much in the minds of all concerned with it; and, doubtless, they will be more readily and cordially admitted than the others to which allusion has been made. The season of 1862 was so unmistakably ruinous, that much of the present distress and necessities of Carse farmers, for years to come, may be ascribed to its operation.

So standing the case, what is to be done to mend it? Any one can see at a glance that of the two branches of agricultural husbandry, viz., grain-growing and rearing and keeping of stock,

whether cattle or sheep, the former has been exceedingly depressed, and the price of produce much below the average, or the rates in prospect of which the land was taken, and that in the latter profits have been realised far beyond the most sanguine expectations. No doubt the Carse farmers have of late years taken up stock-feeding more seriously, as already alluded to; but it may be doubted whether they have done it on the best principles. The light-land farmers—who thirty years ago in Perthshire kept little more stock than their brethren in the Carse, and grew corn on still more exhausted land—began to lead the way into stock-keeping. The Carse farmers, as a class, have followed them, and have done what they could in growing turnips for cattle; and they have fed cattle in winter, instead of the old plan of wintering old cattle very poorly. In this feeding of cattle they have laboured under great disadvantages; they had to go, as formerly, to the autumn trysts, and buy lean cattle at double the price their predecessors did, with a very considerable risk of not getting a sound article, and of losing the whole from pleura within a month or two. So great have been the losses from this cause, that if the Carse farmers have not gone so deeply into cattle-feeding as was desirable, they may well point to their risks and losses as their justification. Another disadvantage arose from this, that they bought in the cattle to eat a certain quantity of turnips; and when these turnips were eaten, according to their system, the cattle must be sold; and as all their neighbours were in the same position, an excess of cattle, and many of them not prime fat, were yearly thrown into the market in the month of April, and prices were therefore lowered when they wished to sell. The Carse farmers get the lowest price for the fattened stock after having paid the highest price for them when lean. They buy dear and sell cheap; and the balance of profit is often less than they would like to confess. This year an ox of forty-five stones was in July worth L.3 more than one of the same weight was two months previously. Scarcely any of the Carse farmers have ever thought that it would pay them to keep these cattle on by small potatoes, cake, or such means, till the cutting grass came, about the 20th of May, and so have them good fat at mid-summer, although by these means they might have done so. The misfortune has been that the Carse farmers have been forced into a new business when they undertook stock-keeping,—into a business, in its details of buying, feeding, and selling, much more difficult to be learned than grain-growing, and not to be learned to any perfection by every man. The Carse, with a permanent reduction on the value of its staple crop—wheat, offered little inducement for men, who thoroughly understood stock, to come into a district supposed not to be suited for cattle, and to set a better example, which they could only do by

a deliberate study of the subject as applicable to it, and not by the introduction of the system with which they were themselves already familiar on a different soil. The Carse farmers have therefore contented themselves with imitating the light-land farmers. They saw them feeding cattle fat with turnips, and they thought they would feed cattle fat with turnips also, and within the same time of the year, thus having all the light-land cattle to compete with theirs. All this, however, is a fatal mistake. Turnips are by no means a crop specially suited to carse land. No doubt there is much black land in the Carse that grows them well; but in the stiffer soils there is much additional labour and uncertainty in getting a crop, and at best it is generally a very second-rate one.

On the other hand, no land in the world can grow finer summer green crops than the Carse clays. Clover and tares, provided the land is in fair condition, are crops peculiarly suited to the Carse; and if such be the case, is it not reasonable to expect that they should be largely grown, and that stock should be fed with them? Does not the whole matter resolve itself simply into this, that the Carse farmers *should feed cattle in* SUMMER *instead of* WINTER?

And is not *Summer-feeding* of cattle, in one word, the panacea which the Carse farmers have it in their power to adopt, in order to restore and maintain the condition of their land for grain crops? Would not such a system of management enable them to make a handsome profit, both on grain and stock, and to pay their rents without inconvenience? By such a system it is not proposed to reduce, but rather to increase the portion of land under grain, adopting the seven-shift with four grain crops in place of the six-shift with three; but there must be little hay cut—none for sale—and no more made than is required for the horses on the farm. The breadth of potatoes or beans must be reduced, and turnips and tares substituted for them. And with regard to the division in grass, the ryegrass should only be sown at the rate of two pecks per acre, in place of a bushel, as hitherto, with ten pounds of red clover. Moreover, the young grass should be cut as early and rapidly for the first cutting as possible, and thereby the second cutting will be good and early, soon after the time that the first cutting is completed. For this purpose a much larger stock will be required than most people have any idea of. It was found, in the summer of 1865, on a home farm in the Carse, that the first cutting kept four two-years' old cattle per Scots acre, and lasted for two months. Four Scots acres kept eleven two-year olds, five cart horses, and half fed eight milch cows. The proportion applicable to the feeding cattle was about a quarter of an acre each, and when sold in August, L.2 per month was got for the soiling of each of them, while fifty tons of first-rate manure were made by them. But this is quite a new thing in this district. There is scarcely a farm in the Carse that has

any cattle upon it during summer, except the few cows for supplying milk to the family and servants; whereas, if it were under proper management, every cattle reed and feeding byre should be as full of cattle as they are during winter in the stock-feeding districts; and there is no district in Scotland capable of turning out the same number of fat cattle. It may be asked, How is this to be carried out? what is to be done with the turnips and straw with which we fed in winter? and where are we to get straw for the littering of cattle during such extensive summer-feeding? To this it is answered. Instead of cattle to be fed off in the limited time afforded by the turnips, good two-year-olds should be bought for wintering, and as many of them as justice can be done to, as a heavy stock is required to eat down the clover crops, between the 20th of May and 10th of July, by which time the whole crop should, if possible, be cut once. But in wintering these cattle there must be great economy of straw, as nearly a third of the whole stock of straw must be reserved for litter in summer, when the cattle are soiled in the house; and as no cattle will be fed fat in winter for sale in spring, there will be less difficulty in giving the winterers fair play, and they should be in good order for the cut clover, which, in a favourable season, may be ready by the 20th of May. When cut so early, the second cutting will be grown by the time the end of the first has been reached; and as a succession of tares will be ready from that time, there could be no lack of food to carry them on. The queys may be fat by midsummer, and the stots before the end of the grass. The Carse farmer will have two great advantages by such a plan,—he can both buy and sell at any time that he can do so to most advantage, and he will hold the cattle for such a time, and sell them when the markets are not over-supplied, that he may expect a handsome profit. But the principle on which the growth of clover mixed with ryegrass, in a greatly reduced degree, is urged, is, that while the latter is truly a cereal, and exhausting in its effects to a greater or less degree, clover grows with a bulbous tap-root, which, when ploughed up, enriches the land and supplies it with decomposing vegetable matter, so essential to the fertility of strong clay soil. Such being the case, it is clear that the intervening crop of grass in the Carse rotation is restorative only as the clover preponderates over the ryegrass. When, as is too often the case, there is little or no clover, and the crop is mainly ryegrass, it must be most exhaustive to the soil; for wheat or barley followed by ryegrass, and then broken up for oats, is as severe a sequence as any three white crops that can be put into land. In England, clover is grown without ryegrass, and attempts to do so in Scotland have been attended with equal success in favourable seasons; but in others, from severe winters and bleak springs, the clover

plants suffer from the want of shelter that ryegrass affords them; and it is found safer to sow two pecks of ryegrass with clover, and not trust the clover alone. To get the advantage of clover, it must be cut and cattle soiled in the house. Were cattle pastured on it, the same number could not be kept, probably not more than one-half; but, in addition, the land will not derive the same benefit from the clover, if pastured. This assertion may seem strange, almost paradoxical, to those whose attention has not been directed to the subject; for it is natural to suppose that the land must be more enriched by the manuring of the cattle than if it does not receive that advantage; but the truth is, that red clover is a plant that draws much of its nourishment from the air, and its tap-root fed and increased greatly through the leaves. It must, therefore, be allowed to grow up with a certain foliage before it is cut; and after being cut it must again be allowed to throw out leaves, and acquire a vigorous second growth before it is again cut; and by such treatment the root, which is the source of fertility to after crops, will grow to perfection. By pasturing, on the contrary, the leaves are being constantly cut over, and the plant nibbled and injured, so that the root attains only very small size, and imparts a correspondingly less degree of vegetable admixture to the soil when broken up for a grain crop. On the other hand, the clover should not be allowed to grow too old and woody and go much to bloom, for its vigour will be impaired, and it will start much more slowly for its second growth. As to the straw for summer. At present there can be no doubt that straw in the Carse is much wasted, and with proper attention there should be abundance for clover summer soiling. Under the present system there are only five months for breaking it down into dung, and as it is more than the cattle are able to do, it is left about the passages and roads, where it will at least become wet, although it may not be much the better of its wetting. Straw by itself is poor manure; it truly should be regarded as a sponge or medium for containing and accumulating enriching animal matter, to be rotted by the action and heat of the animal substance; but many Carse farmers have believed the contrary, and certainly they have been encouraged in the belief by their landlords and factors, and by the leases they have been called on to sign. If they ever read these sometimes rather lengthy documents, they would find that they lay themselves open to all the penalties of the law by the abstraction of a stone of straw, while there is no provision made for the application of the crops that could make the straw into valuable manure by consuming them along with it. One would suppose, from reading any ordinary lease, that both landlord and factor thought that if they bound the tenant to keep the straw on the land,

they might defy him to deteriorate the farm. Low as the farming in the Carse undoubtedly is, it is not to any provisions in the leases, as they are at present drawn, that we can look for any improvement. They are all framed in accordance with the low system that has prevailed, and wherever good management does prevail in this district, it is attributable not to the provisions in the lease, but to the energy and enterprise of the tenant. It is undeniable, that to meet the requirements of the land for keeping it in condition under the Carse system, L.1 an acre per annum, for every acre of the farm, must be laid out in good solid farm-yard or stable and byre dung beyond what is made on the farm; but though there are exceptions, few men of the present day who sell hay and potatoes off the farm, think of making such an expenditure, and those who do confine the application to the earlier part of their leases, and suspend it toward their conclusion. Farmers in general would be more disposed to buy good manure, if they reflected that the addition of L.1 per acre to the rent and expenses, which, taken together, may be put on good land at L.7, is in reality only a seventh, while the increase, if produced, may eventually, by perseverance in the system, reach 50 per cent. With the course of cropping allowed in the Carse, and the permission to sell hay and potatoes, the protecting clauses in the present leases are utterly inadequate for the purpose; and instead of giving in to the cry from certain quarters, that there should be greater latitude given as to cropping, a system of management should be prescribed and enforced that would not leave the matter to the mere chance of getting a good man, especially if there should be a general change of system. By low farming is meant the opposite of high farming, which is a common expression in the present day. If it is a fact that there are farmers, and not a few, in the Carse who plough and sow, and apply no more manure than what is made on the farm, while they sell off all the grain, except a little given to their horses, all their hay, with the same exception, and all their potatoes, except what the pig gets, it may assuredly be called low farming, and lower farming than probably in any other district in Scotland. The farmers round Edinburgh, and all large towns, sell as much off their farms as in the Carse, but they bring back enormous quantities of manure to supply the place of the abstractions. They are, and act much as market-gardeners, who sell off all the produce, and who don't expect the pig they keep in the corner for consuming the "blades," to supply the manure required for their garden; but after all, this pig and the blades would manure it nearly as well as the sort of farmer first alluded to, who manures his greater extent with his slender stock. We repeat, the only legitimate exports from a farm are grain and stock. If they are confined to these, the land well managed may main-

tain itself in fair order, but if the illegitimate exports of hay and potatoes are made, its condition can only be maintained by heavy applications of foreign manure—that is to say, manure not made on the farm; and as this manure must be solid stable or byre manure brought from the towns, where, of course, the straw that makes it is not grown, the country at large is only having returned to it the material it has yielded, and, as already said, the lowest estimate of this is at the rate of L.1 per acre per annum. These remarks will explain what is meant by low farming, and also what is meant by fair farming, and the alternative forms of the latter, neither of which, however, are in the least degree entitled to be called high farming. When high farming is spoken of (and there is none of it in Perthshire), it is something in excess of either of the two last. If, in the one case, instead of selling all the grain, except what is required for the horses, a farmer bruises it and feeds his cattle and pigs with a large proportion of it, selling only the best, and if he feeds his stock with oilcake or other bought in material, such as corn and straw bought at roups, and feeds with them to help his own manure heap, also gives his turnips guano and bones besides, while he eats his grass with sheep, or soils it with his cattle in the courts, that system is worthy of the name of high farming; or if, on the other hand, the man who sells off everything, buys back manure, partly dung, and partly bones or other light stuffs, to the value of L.2 or L.3 per acre for every acre of the farm, in place of the L.1, which is the lowest estimate of what is necessary, he in like manner may be said to farm highly. And if the question is put, Which is the best, and which is the worst plan for a tenant to follow? it may safely be said that there can be no surer road to ruin than low farming, though it is one that many a poor Carse farmer has travelled, without apparently convincing that portion of his neighbours whose position is nearest his own, that they are treading hard on his footsteps, and must shortly come to the same end as he. To follow successfully either of the systems of high farming requires a degree of experience, ability, and skill in principles and detail, that is not possessed by all or many who are professional farmers; and it may be better for a man to follow one of the middle courses specified as fair farming, until he finds himself possessed of these requisites of character, and the not less important requisite of cash, which will justify him in adventuring upon the advanced and higher scale of farming now indicated.

There is one point with regard to potato growing, as to which many farmers have been greatly to blame, and lost sight of their own interest. Ever since 1846 the disease has more or less prevailed, and often when the crop was large. The diseased potatoes are worth about 7s. per boll or 28s. per ton for feeding cattle, but

in too many cases they have been sold to the farina mills at prices from 5s. to 7s. per ton, and when the labour and expense of carriage is deducted, the actual price was little more than half their feeding and manurial value. The existence of these farina mills in such a district is an unfavourable feature in regard to its farming. If the diseased crop were so applied, and if a part of the high price obtained for a sound one were spent in purchasing manure required for their cultivation, it would make a great difference on the condition of the land; and potato growing will never be put on a proper footing with relation to that condition and the interest of the proprietor, until both these points receive more attention than they do at present.

While, therefore, bad seasons and low prices of grain, over which the Carse farmers had no control, have acted most prejudicially upon them, it appears that the system so long persevered in *has reduced the condition of the land generally*, and that they and their predecessors have themselves to thank for this; when, if they had adopted a more liberal treatment of their land, and availed themselves more of stock-feeding, they might have been in a condition as flourishing as any class of farmers in Scotland, notwithstanding the high rents paid; and if such a system had been followed, these rents would have been found to be proportionally lower than those paid for worse land. They are regulated by the price of grain, and cattle have been paying well, while the grain rents have been low; but the tenants have had but slight relief from that circumstance, as they still trusted to the grain, and had little hope from cattle. They have been waiting for the tide to rise and float their ship, instead of taking assistance that was available, and the cargo has rotted while they have been looking on.

A small beginning has, however, been made in the right direction, and it is to be hoped that it may extend and be generally adopted.

In justice to the farmers in the county, whether on carse or light lands, it must be allowed that much of the deficiency and want of progress in their agriculture and condition of their land arises from the feeling that their connection with it is limited to the duration of the lease. They enter to a farm in low condition, and spend ten years in improving, and nine years in tearing it down. If they could carry on, during the remainder of the lease, the system some of them begin with, the farm would be in really good heart at its termination. But they dare not do this, because if they did, the farm may be advertised and let, in consequence of the condition it is in, at a rent they, from their own experience, could not promise to pay, to another, who would take out all the condition that had been put in, and then get the rent reduced, or be allowed to go, having made his own of it. Farms

in the hands of even the best men are always rising in condition during the early part of the lease, and falling towards its close, not from miscropping, but by cropping according to the lease, and by not applying such extra manure as such a course of cropping necessitates. It is the same thing as if horses were jobbed for six months, and kept on four feeds of corn per day in the first four months, and on two feeds, with the same work, during the two last. It is probably not very distinctly seen in this light by many landowners, for if it were, surely some plan would be adopted to correct the evil. The best remedy, and the one most likely to lead to steady advancement in the condition of land, would be by a renewal of leases when the land is in good fair condition before the wearing down has begun, and it would pay a tenant then better to give an advance for a fifteen years' lease, after the expiry of the current lease, than to take it at the old rent, or even less, at the termination of the lease. Until some such plan is generally adopted, and tenants feel more security than they have at present that the money they spend in putting and keeping their land in condition will not be lost to them at the end of their leases, we cannot expect any great improvement. At present the English tenant-at-will from year to year feels much safer of a permanent connection with his farm than the Scotch tenant with his nineteen years' lease. The English tenant knows that if he votes with his landlord, and stands a little game damage, he will never have any question raised about the rent he pays. The Scotch tenant, with his lease, may have the luxury of quarrelling with his laird for the whole term of the lease, if so inclined, and whether he quarrels or not, he knows that the bargain ends at its termination, and he must then go or make a new one, under stiff competition, with men perhaps very inferior to himself. It may be doubted, in short, whether the state of agriculture in Scotland is so much consequent on the system of letting on lease as is generally believed, and whether it is not mainly due rather to the perseverance, energy, and frugality that mark Scotchmen in all occupations and in all countries. If the English system had prevailed in Scotland with the same confidence between owner and occupier, it may be argued that the same, or even greater, improvement would have been made, and that Scotchmen in England have farmed on yearly tenure as well or better than even they did in Scotland. On the other hand, in Scotland it is well known that good farms, held on favourable leases by successive liferents, have been badly farmed; but these cases were probably exceptions, and there will always be bad farmers under the most favourable circumstances. There can be no doubt, however, that good farmers would farm much better if they felt greater security in regard to renewal of their leases on fair terms; not that this

is not done, or that it is the exception, but if one case among twenty farms occurs where the lease is not renewed on fair terms to a good tenant, every man thinks the case may be his own, and he must protect himself against such a result.

When referring to England in contrast with Scotland on this matter, it may be observed that in England it would seem that the question "*rent*" enters too little into consideration, while in Scotland it is made of undue importance. Were it more so in England, it might act as a healthy stimulus to exertion on the part of the tenants; while if good farming and good tenants were more practically appreciated in Scotland, the advancement of agriculture, and the relation between landlord and tenant, would both be improved, and there would be no desire on the part of the tenantry to agitate for a serious alteration on the Law of Hypothec.

Notice should be taken of the steam cultivation introduced by Lord Kinnaird. His lordship had half a dozen farms at least thrown on his own hands by the failure of tenants, and the impossibility of getting others at the rent which they formerly paid, and which his lordship believed the farms to be worth if properly managed. Being well aware of the drawback to clay land, in the difficulty and expense of working it wholly with horses, he has had a steam-plough at work during the winters 1863–64 and 1864–65, and the results have been very satisfactory, as the crops have been above the average, while the expense of getting them has been reduced. The steam-plough cuts up the clay into enormous cubes, which the smart frosts of these winters have reduced into a friable state, but after an open winter they might not be so easily managed. It may suit very well for the large concern in which Lord Kinnaird finds himself for the present involved, or for a few of the largest farms in the district; but if the steam-plough is to be more generally adopted, it must be by a party working it for ordinary farmers by the acre, and in the meantime the farmers are watching Lord Kinnaird's proceedings with interest.

These remarks on the past and present state of agriculture in Perthshire may therefore be summed up in few words. The *hill and pasture lands* are in a highly flourishing condition. The *lighter arable lands* have made great progress, and are yearly improving in the system of management and condition; but the *carse lands* have not shared in that advance as yet, and stand much in need of a change of system to one more suitable for the present times. It is more than doubtful whether any change on the law of hypothec would conduce to that. From what has been stated, the Perthshire system has grown under the law of hypothec, and few parts of Scotland would feel a serious change on the law more. No doubt skill and experience in farming are

of little use without capital, but capital without the other is not much better. What is wanted is a tenantry with both skill and capital, and as it may be safely averred that not one-half of the tenantry have these in combination, while the rest have not more than one of them, and often neither, there is a good deal to be done before agriculture is on a right footing. The most hopeful class of farmers are those with skill, who may be a little weak in the requisite capital. Such men will thrive and soon make capital under a fair or rather moderate rent; and there is no surer way to advance the agriculture of a district than by keeping the rents at fair rates, provided the men are good. Supposing the rent is a little easy, the difference between that and a rack rent, or a rent that cannot be racked out of the land, is not lost to the proprietor, for such a tenant applies all his surplus to the improvement of his farm and to the accumulation of stock upon it. It is almost as necessary to the proprietor that his tenant should have capital as to the tenant himself. If capital, therefore, is the desideratum among the tenantry of this county, as it is of many districts in Scotland, it is hard to see how they are to be benefited by a change that would involve them in a diminution of the capital at present applied to their business, which would be the practical result of the abolition of the security which the landlord at present holds.

PROCEEDINGS OF THE CHEMICAL DEPARTMENT.

By Thomas Anderson, M.D., F.R.S.E., Chemist to the Society.

ANALYSIS OF THE SOILS AND SUBSOILS ON WHICH THE FIELD EXPERIMENTS OF 1866 WERE MADE.

In making the analysis of a soil, the object which should be held in view, is not merely to determine with the necessary exactitude the total quantity of each of its constituents, but also to obtain some evidence of the state of combination in which they exist in it. Experiment has shown that a soil may contain abundance of some of the most important and essential elements of plants, and yet remain unfruitful, in consequence of their being in the form of compounds, which are either entirely undecomposable, or so little prone to change, that they are not liberated in sufficient quantity to have any practical value; while another, which is comparatively poor in the same substances, may be extremely fertile, owing to the *ready* accessibility of the smaller quantity found in them. Most soils contain a portion of their constituents in a state in which they are unable to act as nutriment to the plants which grow upon them; and the remainder may, and often does, exist in several forms, some more and some

less easily accessible to the organs of the plant. To obtain a satisfactory knowledge of these different forms of combination is a most difficult problem. A soil is not a definite chemical compound, but a mixture of a great variety of substances, of very variable composition. We easily recognise in it sand and clay, which form its chief bulk; but that which we call sand often consists to a large extent of the comminuted fragments of the rocks from which the soil is derived; and under the term clay, we comprise a variety of substances which, though possessing in a more or less marked manner the character of plasticity, are really often very different in composition and in properties. A perfect analysis would seek to separate these different substances; but as this is practically impossible, the chemist is obliged to content himself with such an investigation as may serve to classify the nutritive constituents into groups of more or less ready accessibility.

It is generally admitted, that that part of a soil which resists the action of strong acids is entirely useless for the time to the plants which grow upon it, but to what extent those which are extracted by acids are available, is not so clear. That the whole of them are not equally so is very obvious, for the slightest attention to the effect of an acid upon the soil shows that a part of it quickly and easily dissolves, while another portion requires the long continued action of the acid, aided in all probability by heat.

There can be no doubt at all that the portion of the soil which dissolves most easily is that by which plants are mainly fed; and hence it was formerly the practice, in complete analyses of soils, to determine the proportion of the constituents which dissolve in water, although it was noticed that this quantity was always small, and did not differ to any material extent, even in soils which differed greatly in fertility. At the period in question, it was supposed that plants could only assimilate those substances which had dissolved in water, and hence peculiar importance was attached to this part of a soil; but when it was discovered that soils, and especially the most fertile soils, had the power of withdrawing from solution, and actually bringing into an insoluble state those very substances on which the plant is most dependent, the accurate determination of the substances soluble in water lost the interest which formerly belonged to it, and chemists ceased to occupy themselves with what is a very troublesome and laborious part of a soil analysis. The analysis was, therefore, confined to determining under one head all the substances which could be extracted from the soil by the action of an acid, invariably hydrochloric acid, and under another those which resisted the action of this solvent, and which can only become soluble by virtue of those slow and gradual changes, to which even the most intractable substances are liable under the long continued action of air and moisture.

There can be no question that an analysis, conducted in this way, is defective, because it draws no distinction between the portion of the nutritive constituents which dissolve easily, and that which requires the long-continued action of the strong acid, although the former must be much more important than the latter. Neither can it be doubted, that the mineral matters which are absorbed by the roots pass through the organs of the plant which takes them up in a state of solution, and we are really forced to admit that the roots must exercise a solvent action upon those substances which we know to be almost entirely insoluble in the water of the soil. Of the nature of this action we can at present form no idea; but whether it be caused by an acid or not, it must unquestionably be due to a solvent of a far feebler character than that which is employed in the analysis of a soil, and hence it may very possibly happen that a portion of that which, from its being soluble in hydrochloric acid, is considered to be available to the plant, may only be partially so, a certain portion of it, which yields to the strong acid, being nevertheless retained by a sufficiently powerful affinity to resist the solvent action of the roots.

What we especially require, is some mode of distinguishing between the more and less accessible parts of the soluble constituents of the soil, but it is far from easy to devise a plan by which this can be accomplished in a satisfactory manner. In commencing the analysis of the soils in which the Field Experiments of 1866 were made, I was extremely desirous of having some information on this point, and gave to it a great deal of consideration. The plan which at once suggests itself, is to use hydrochloric acid of different degrees of concentration, commencing with it in a highly diluted state, and analysing the solution so obtained, then using a more concentrated acid, and thus obtaining any number of solutions which might be deemed advisable. Having had occasion some years since to make a series of experiments for a very different purpose, in which this method was employed, I had satisfied myself that very great difficulty existed in obtaining uniform results by means of it, and I thought it best to avoid it, and to adopt instead the treatment of the soil with a very feeble acid. For this purpose I selected dilute acetic acid, and the results, though not all that could be wished, present many points of interest. The quantity of substances dissolved by it is much smaller than was anticipated, and it might probably have been better to have used it in a more concentrated state; but having commenced with a particular acid, it was used throughout the whole series, so that the results might be comparable with one another.

The exact method in which the analysis was conducted may be shortly described.

The soil was first spread out in a thin layer for some days,

until it was thoroughly air dried, and the clods were broken down with a piece of wood. The whole was then passed through a sieve of eight holes to the inch, and the portion remaining on it was set down as stones or gravel; while that which passed through was the soil, and was submitted to chemical analysis, after having been reduced to fine powder in an agate mortar.

A quantity of the pulverised soil was weighed off, and digested for some hours at a heat approaching the boiling-point, with dilute acetic acid, containing 7·5 per cent of the real acid. The insoluble matter was separated by filtration, and carefully washed with water. The solution was divided into five portions, of which one was used for the determination of iron, alumina, lime, and magnesia. The iron was determined by permanganate, and the other constituents in the usual manner. A second portion was used for alkalies, and the other three served for sulphuric acid, phosphoric acid, and chlorine, or such of them as happened to be present.

Another portion of the soil was treated with hydrochloric acid, and the solution being filtered, the washed residue was weighed. The solution was then evaporated for the separation of soluble silica, and the filtered fluid divided into portions for the estimation of the different constituents, which were determined by the ordinary processes.

A third portion was used for the determination of carbonic acid.

The matter insoluble in acids was fused with a mixture of carbonates of potash and soda, the solution evaporated for separation of silica, and iron, alumina, lime, and magnesia determined in the fluid. The sum of these constituents always amounted to within a fraction of a per cent. of the quantity used, and showed that alkalies were either entirely absent in the insoluble part, or were present in it in so small a quantity as to render it unnecessary to make separate estimations of potash and soda.*

Hygrometric moisture, organic matter, and nitrogen were then determined in separate portions of the soil. The results of all these determinations having been calculated in one-hundredth parts, the quantities obtained from the acetic solution were deducted from those of the hydrochloric solution, and the difference gave the amount of each constituent soluble in hydrochloric acid, and insoluble in acetic acid.

The numbers so obtained give as exact an idea of the chemical composition of those soils as it is well possible to have in the present state of our knowledge; but, in order to complete the investigation, a mechanical analysis was also made by Schultze's

* It is interesting to notice the contrast in this respect between these soils and the wheat soils analysed for this Society some years since. Some of the latter contained a large quantity of alkalies in the insoluble portion. It must be remembered that the soils in question were of very high quality, and selected as typical wheat soils of great fertility.

method. This process, which is described in the more recent works on chemical analysis, is founded on the principle of subjecting the soil to a regulated current of water, by means of which the finely-divided portion of the soil is levigated away from the coarser part. The whole is first divided into gravel, by sifting it through a sieve with eight holes to the inch, and the soil is then levigated in such a manner as to obtain coarse sand, fine sand, clay, and organic matter. Schultze separates the coarse sand into two parts, by means of a sieve with forty holes to the inch, and calls that which does not pass through, gravelly sand; but I have not thought it advisable to draw this distinction. The calculation of the mechanical analysis is made in the *dry* soil, after deduction of the organic matters. It is to be noticed that it includes the gravel; and this, and the absence of water, are the reasons why the quantity of organic matter in the chemical and mechanical analyses do not correspond. It would require some detail to explain the mode of calculation, but any one acquainted with the analysis of soils can easily see how it is executed. The soil is, in every case, a fair sample of the upper ten inches, and the subsoil of the ten inches immediately below; and they were taken by cutting a slice from the side of a trench of the required depth.

I shall prefix to each analysis a short account of the external characters of each sample.

SOIL FROM THE FARM OF DIRLETON, ON WHICH MR HOPE'S EXPERIMENTS WERE MADE.

This soil, which lies close to the sea, was light and sandy, and, although clayed at the rate of 200 carts per acre, still had much the appearance of a dirty sea sand. The soil itself had a somewhat dark colour, due to organic matter, and contained a number of white specks, which were found to be carbonate of lime. The subsoil retained more of the characters of sea sand, but clay and lime had penetrated into it, though not to so great an extent, the particles of carbonate of lime being much less numerous. There was no gravel in either the soil or subsoil.

Soluble in Acetic Acid.

	Soil.	Subsoil.
Peroxide of Iron, ...	0·075	0·150
Alumina, ...	0·175	0·050
Lime, ...	1·036	0·901
Magnesia, ...	0·005	0·081
Potash, ...	0·180	0·210
Soda, ...	0·100	0·014
Sulphuric Acid, ...	0·001	0·034
Chlorine, ...	...	0·018
Phosphoric Acid, ...	...	0·063
Total Soluble in Acetic Acid,	1·572	1·521

Soluble in Hydrochloric Acid, but Insoluble in Acetic.

Silica,	0·150	0·380
Peroxide of Iron,	1·256	0·709
Alumina,	1·944	1·064
Lime,	...	...
Magnesia,	0·302	0·324
Potash,	0·339	0·035
Soda,	0·270	0·323
Sulphuric Acid,	...	0·188
Phosphoric Acid,	0·171	0·079
Carbonic Acid,	0·280	0·700
Total Soluble in Hydrochloric Acid,	4·712	3·802

Insoluble in Acids.

Silica,	82·40	86·950
Peroxide of Iron,	0·19	0·160
Alumina,	5·25	3·390
Lime,	0·57	0·230
Magnesia,	0·04	0·044
Alkalies and Loss,	...	0·543
Total Insoluble in Acids,	88·450	91·317
Organic Matter,	4·495	3·060
Water,	1·200	0·300
	100·429	100·000
Ammonia,	0·28	0·422
Hygrometric Water,	2·490	1·300
Total Chlorine,	0·032	0·163
Gravel,	...	...
Soil, Coarse Sand,	86·940	95·16
Soil, Fine Sand,	2·360	0·74
Soil, Clay,	6·151	1·03
Soil, Organic Matter,	4·549	3·07
	100·000	100·00

SOIL FROM THE FARM OF MR SHIRRIFF, SALTCOATS, DREM.

This soil was a somewhat stiff clay loam, which dried up into rather firm clods, which, however, softened down rapidly with water. Its colour, when dry, was dark grey. It contained small particles of carbonate of lime; and the gravel consisted of rounded fragments of what appeared to be a disintegrated trap. They were all small, only a few of them reaching the size of a horse bean. The subsoil was paler, and had more of a yellowish shade, and the gravel was similar in all respects to that found in the soil.

Soluble in Acetic Acid.

	Soil.	Subsoil.
Peroxide of Iron,	·037	...
Alumina,	·023	...
Lime,	·644	0·392
Magnesia,	·079	0·094
Potash,	·054	0·069
Soda,	·071	0·016
Sulphuric Acid,	·027	0·055
Phosphoric Acid,	·032	...
Chlorine,	·010	0·010
Total Soluble in Acetic Acid,	·977	0·636

Soluble in Hydrochloric, but Insoluble in Acetic Acid.

Silica,	·348	0·324
Peroxide of Iron,	2·650	1·571
Alumina,	3·390	4·529
Lime,	·319	0·225
Magnesia,	·354	0·450
Potash,	·142	0·145
Soda,	·005	0·006
Sulphuric Acid,	·110	0·007
Phosphoric Acid,	·070	0·051
Carbonic Acid,	·432	0·690
Total Soluble in Hydrochloric, but Insoluble in Acetic Acid,	7·820	7·998

Insoluble in Acids.

Silica,	72·142	76·898
Peroxide of Iron,	·508	0·795
Alumina,	9·300	6·808
Lime,	·890	0·579
Magnesia,	·305	0·320
Alkalies and Loss,	·168	0·076
Total Insoluble in Acids,	83·313	85·476
Organic Matter,	6·000	4·290
Water,	1·890	1·630
	100·000	100·000
Ammonia,	·153	0·084
Carbon,	2·119	...
Hygrometric Water,	3·080	3·340
Gravel,	1·568	4·206
Soil, Coarse Sand,	75·526	68·138
Soil, Fine Sand,	6·132	4·893
Soil, Clay,	10·654	18·615
Soil, Organic Matter,	6·020	4·148
	100·000	100·000

SOIL FROM THE FARM OF MR RICHARDSON, DRYLAWHILL, PRESTONKIRK.

This was a free soil, well adapted to the cultivation of the turnip, and in high condition. Its colour, when dry, was dark reddish brown, becoming still darker when moistened with water. It contained very little gravel, but, by an unfortunate mistake, the whole was reduced to powder without its being separated. The quantity, however, was so small that it does not materially influence the result. The subsoil had a yellower colour than the soil, but in other respects differed very little from it in appearance.

	Soil.	Subsoil.
Soluble in Acetic Acid.		
Peroxide of Iron,	0·029	...
Alumina,	0·031	0·200
Lime,	0·280	0·336
Magnesia,	0·064	0·162
Potash,	0·115	0·125
Soda,	0·027	0·025
Sulphuric Acid,	0·034	0·122
Phosphoric Acid,	0·012	0·079
Chlorine,	0·148	0·086
	0·740	1·135
Soluble in Hydrochloric Acid, but Insoluble in Acetic.		
Silica,	0·089	0·325
Peroxide of Iron,	4·051	2·740
Alumina,	4·769	4·215
Lime,	0·336	...
Magnesia,	0·533	0·368
Potash,	0·226	0·077
Soda,	0·127	0·165
Sulphuric Acid,	0·061	0·022
Phosphoric Acid,	0·152	0·067
Carbonic Acid,	0·060	0·820
	10·404	8·799
Portion Insoluble in Acids.		
Silica,	71·037	67·720
Peroxide of Iron,	0·410	1·076
Alumina,	7·872	11·304
Lime,	1·110	0·910
Magnesia,	0·323	0·636
Alkalies and Loss,	0·144	0·320
	80·896	83·966
Organic Matter,	5·980	4·800
Water,	1·980	1·300
	100·000	100·000
Ammonia,	0·182	0·045
Equal to Nitrogen,	0·154	0·037
Hygrometric Moisture,	3·700	0·123

Mechanical Analysis.

Coarse Sand,	77·469	86·130
Fine Sand,	2·399	1·970
Clay,	14·032	7·037
Organic Matter,	6·100	4·863
	100·000	100·000

SOIL FROM MR HARPER, SNAWDON, GIFFORD.

This soil, which lies very high, differs greatly in its appearance from the others. Its colour is pale yellowish brown, with a grey shade. It contains more than a fourth of its weight of gravel, consisting partly of rounded stones, which look like a disintegrated trap, and angular fragments of an indurated clay slate. The subsoil, which is extremely light in colour, consists to a still larger extent of gravel. It contains one-third of its weight, and the whole of this is clay slate in angular fragments. Notwithstanding its pale colour, it contains a large quantity of organic matter.

Soluble in Acetic Acid.

	Soil.	Subsoil.
Peroxide of Iron,	0·004	0·160
Alumina,	0·221	0·215
Lime,	0·154	0·215
Magnesia,	0·072	0·094
Potash,	0·092	0·063
Soda,	0·015	0·060
Sulphuric Acid,	...	0·130
Chlorine,	0·032	0·092
Phosphoric Acid,	0·080	...
Total Soluble in Acetic Acid,	0·670	1·019

Soluble in Hydrochloric Acid, but Insoluble in Acetic.

Silica,	0·170	0·235
Peroxide of Iron,	1·866	1·640
Alumina,	3·959	5·335
Lime,	...	...
Magnesia,	0·198	0·119
Potash,	0·128	0·173
Soda,	0·121	0·090
Sulphuric Acid,	0·127	0·150
Phosphoric Acid,	0·040	0·050
Carbonic Acid,	0·040	0·673
Total Soluble in H Cl,	6·650	8·465

Insoluble in Acids.

Silica,	72·800	68·118
Peroxide of Iron,	0·275	0·850
Alumina,	9·910	11·106
Lime,	0·286	0·476
Magnesia,	0·506	0·796
Alkalies and Loss,	0·303	0·170
Total Insoluble in Acids,	84·080	81·516

Water,	1·490	1·480
Organic Matter,	7·110	7·520
	100·000	...
Ammonia,	0·253	...
Hygrometric Water,	4·410	3·54
Total Chlorine,	0·491	0·22
Gravel,	26·50	33·306
Soil, Coarse Sand,	55·74	50·050
Soil, Fine Sand,	1·19	2·650
Soil, Clay,	11·27	8·904
Soil, Organic Matter,	5·30	5·080
	100·00	100·000

SOIL FROM MR NISBET, RUMBLETON, GREENLAW, DUNSE.

This was a light turnip soil, and both it and the subsoil were very similar in appearance; they contained small rounded pebbles, which seemed to be decomposed greenstone, and in the soil was a small piece of limestone.

Soluble in Acetic Acid.

	Soil.	Subsoil.
Peroxide of Iron,	0·154	0·185
Alumina,	0·066	0·255
Lime,	0·436	0·392
Magnesia,	0·093	0·259
Potash,	0·118	0·014
Soda,	0 293	0·036
Sulphuric Acid,	0·048	0·036
Chlorine,	0·007	0·009
Phosphoric Acid,	...	0·050
	1·215	1·236

Soluble in Hydrochloric Acid, but Insoluble in Acetic Acid.

Silica,	0·105	0·165
Peroxide of Iron,	2·117	1·895
Alumina,	2·112	2·015
Lime,	0·112	0·041
Magnesia,	0·426	0·281
Potash,	0·328	0·181
Soda,	0·158	0·094
Sulphuric Acid,	0·110	0·135
Phosphoric Acid,	0·191	0·017
Carbonic Acid,	0·170	0·140
Chlorine,	...	0·028
	5·829	6·228

Insoluble in Acids.

Silica,	78·993	80·940
Peroxide of Iron,	0·611	0·648
Alumina,	3·615	4·399
Lime,	0·409	0·609
Magnesia,	0·258	0·143
Alkalies and Loss,	0·890	0·293
	84·776	100·000
Organic Matter,	6·220	4·858
Water,	1·960	1·882
	100·000	...
Ammonia,	0·234	0·175
Hygrometric Water,	3·800	2·250
Gravel,	7·910	11·056
Soil, Coarse Sand,	82·420	81·556
Soil, Fine Sand,	1·520	1·377
Soil, Clay,	2·310	1·698
Organic Matter,	5·840	4·403
	100·000	100·000

SOIL FROM MR ANDERSON, BOYSACK.

This soil was darkish grey when dry, and when moist its colour was very dark. It contained only very small pebbles, some of them pure silicious, and others varying in appearance, and clearly of several different kinds. The subsoil was paler coloured, and the fragments of rock were more angular than in the soil.

Soluble in Acetic Acid.

	Soil.	Subsoil.
Peroxide of Iron,	0 080	0·029
Alumina,	0·160	0·031
Lime,	0·268	0·294
Magnesia,	0·095	0·079
Potash,	0·059	0·115
Soda,	0·022	0·077
Sulphuric Acid,	0·041	0·037
Phosphoric Acid,	0·101	0·012
Chlorine,	0·010	0·049
	0·836	0·723

Soluble in Hydrochloric Acid, but Insoluble in Acetic Acid.

Silica,	0·360	0·204
Peroxide of Iron,	2·430	5·011
Alumina,	2·530	4·789
Lime,	0·236	0·098
Magnesia,	0·697	0·325
Potash,	0·060	0·050
Soda,	0·142	0·041
Sulphuric Acid,	0·067	0·009
Phosphoric Acid,	0·102	0·102
Carbonic Acid,	0·080	0·020
	6·704	10·649

Insoluble in Acids.

Silica,	68·571	68·824
Peroxide of Iron,	1·990	0·945
Alumina,	10·976	10·872
Lime,	1·058	1·045
Magnesia,	0·523	0·451
Alkalies and Loss,	0·742	0·611
	83·860	82·748
Organic Matter,	7·020	3·870
Water,	1·580	2·010
	100·000	100·000
Ammonia,	0·240	0·097
Hygrometric Water,	3·820	3·330
Percentage of Gravel,	6·44	1·40
Soil, Coarse Sand,	75·47	76·53
Soil, Fine Sand,	7·06	4·94
Soil, Clay,	4·47	13·24
Soil, Organic Matter,	6·56	3·89
	100·00	100·00

SOIL FROM MR BOWIE, MAINS OF KELLY.

A remarkably light-coloured soil. When dry, its colour is that of a very pale guano; and the subsoil is even lighter in tint. When moist, they are of course darker, but still only a moderate brown. They contain some very hard silicious stones, which are all more or less water-worn.

Soluble in Acetic Acid.

	Soil.	Subsoil.
Peroxide of Iron,	...	0·003
Alumina,	0·125	0·037
Lime,	0·182	0·090
Magnesia,	0·054	0·115
Potash,	0·070	0·042
Soda,	0·020	0·039
Sulphuric Acid,	...	...
Phosphoric Acid,	0·087	...
Chlorine,	0·035	...
	0·573	0·326

Soluble in Hydrochloric Acid, but Insoluble in Acetic Acid.

Silica,	0·300	0·080
Peroxide of Iron,	2·373	0·657
Alumina,	4·177	0·423
Lime,	0·111	0·134
Magnesia,	0·288	0·678
Potash,	0·120	0·287
Soda,	0·007	0·128
Sulphuric Acid,	0·057	0·020
Phosphoric Acid,	0·044	0·006
Carbonic Acid,	0·240	0·090
	7·711	10·503

Soluble in Acids.

Silica,	64·610	63·913
Peroxide of Iron,	3·400	1·821
Alumina,	14·476	17·194
Lime,	0·610	0·376
Magnesia,	0·210	0·305
Alkalies and Loss,	0·250	0·376
	83·556	83·985

Insoluble in Acids.

Water,	1·90	2·116
Organic Matter,	6·26	3·070
	100·000	100·000
Ammonia,	0·200	0·039
Hygrometric Moisture,	2·960	3·760
Gravel,	2·32	0·83
Soil, Coarse Sand,	79·99	81·28
Soil, Fine Sand,	1·41	1·25
Soil, Clay,	10·05	13·53
Soil, Organic Matter,	6·23	3·11
	100·00	100·000

SOIL FROM MR MUSTARD, LEUCHLAND, BRECHIN.

Both soil and subsoil in this case are dark coloured, even when dry, and are so similar that it is difficult to distinguish them from one another. The subsoil, however, is redder in tint. There is a close resemblance also in the gravel, which consists chiefly of much decomposed matter, which looks like altered greenstone, and there are a few fragments of mica slate.

Soluble in Acetic Acid.

	Soil.	Subsoil.
Peroxide of Iron,	0·076	0·102
Alumina,	0·074	0·190
Lime,	0·184	0·095
Magnesia,	0·090	0·180
Potash,	0·055	0·020
Soda,	0·122	0·021
Phosphoric Acid,	0·034	0·070
Sulphuric Acid,	0·057	0·081
Chlorine,	0·014	0·012
Carbonic Acid,	...	0·210
	0·706	0·981

Soluble in Hydrochloric Acid.

Silica,	0·216	0·080
Peroxide of Iron,	2·396	3·069
Alumina,	3·114	2·839
Lime,	0·509	0·151
Magnesia,	0·356	0·374
Potash,	0·295	0·112
Soda,	0·063	0·084
Phosphoric Acid,	0·045	0·032
Sulphuric Acid,	0·024	0 021
Carbonic Acid,	0·110	...
	7·128	6·740

Insoluble in Acids.

Silica,	73·015	74·135
Peroxide of Iron,	1·422	0·647
Alumina,	9·698	10·238
Lime,	0·797	0·758
Magnesia,	0·297	0·278
	85·229	86·074
Organic Matter,	4·807	. 5·035
Water,	2·130	1·170
	100·000	100·000
Ammonia,	0·164	0·149
Hygrometric Water,	3·780	...
Total Chlorine,	0·024	...

Mechanical Analysis.

Gravel,		5·56	8·905
Soil,	Coarse Sand,	73·33	78·970
	Fine Sand,	10·79	1·849
	Clay,	5·70	5·451
	Organic Matter,	4·62	4·825
		100·00	100·000

SOIL FROM MR YOUNG, HIGHFIELD, AYR.

This soil was dark in colour, and contained only a small quantity of gravel; but I am unable to state its quantity, as it was not separately weighed. The same is the case with the subsoil, which is somewhat redder than the soil, but in all other respects similar to it, though lighter and more sandy.

Soluble in Acctic Acid.

	Soil.	Subsoil.
Peroxide of Iron,	0·153	...
Alumina,	0·017	...
Lime,	0·268	0·213
Magnesia,	0·076	0·158
Potash,	0·031	0·076
Soda,	0·058	0·010
Sulphuric Acid,	0·058	0·041
Phosphoric Acid,	0·147	0·081
Chlorine,	0·019	...
	0·827	0·579

Soluble in Hydrochloric Acid, but not in Acctic Acid.

Silica,	0·060	0·144
Peroxide of Iron,	4·438	5·714
Alumina,	3·072	3·646
Lime,	0·056	0·123
Magnesia,	0·356	0·498
Potash,	0·150	0·164
Soda,	0·061	0·025
Sulphuric Acid,	0·099	0·096
Phosphoric Acid,	0·262	...
Carbonic Acid,	0·120	0·160
	8·674	10·570

Insoluble in Acids.

Silica,	72·130	76·041
Peroxide of Iron,	1·372	0·285
Alumina,	5·598	2·327
Lime,	0·838	0·546
Magnesia,	0·513	0·163
Alkalies and Loss,	...	0·449
	80·451	79·811
Water,	2·200	2·750
Organic Matter,	7·848	5·290
	100·000	100·000
Ammonia,	0·260	0·176
Equal to Nitrogen,	0·214	0·145
Hygrometric Water,	3·220	3·400

Mechanical Analysis.

Soil,	Coarse Sand,	81·831	87·66
	Fine Sand,	1·669	1·04
	Clay,	8·484	4·84
	Organic Matter,	8·016	6·46
		100·000	100·000

NOTE.—The soil was powdered by mistake, therefore gravel could not be determined.

SOIL FROM MR SWANWICK, WILTSHIRE.

This soil differs remarkably from all the others. It dries up into clods as hard as bricks, having an exceedingly pale colour. Moistened with water, it becomes extremely plastic, and might almost be used for making bricks. Notwithstanding its pale colour, it contains much organic matter, and when heated, exhales the smell of burning peaty matter. It is very free from stones. The subsoil is similar in all respects, and still lighter in colour.

Soluble in Acetic Acid.

	Soil.	Subsoil.
Peroxide of Iron,	0·042	0·025
Alumina,	0·198	0·225
Lime,	0·228	0·420
Magnesia,	0·138	0·235
Potash,	0·180	0·063
Soda,	0·006	0·050
Sulphuric Acid,	0·034	0·042
Phosphoric Acid,	0·006	...
Chlorine,	0·005	...
Total Soluble in Acetic Acid,	0·837	1·060

Soluble in Hydrochloric, but Insoluble in Acetic Acid.

Silica,	0·350	0·215
Peroxide of Iron,	4·418	5·515
Alumina,	7·102	9·675
Lime,	0·208	0·062
Magnesia,	0·342	0·847
Potash,	0·553	0·977
Soda,	0·036	0·234
Sulphuric Acid,	0·138	0·006
Phosphoric Acid,	0·019	...
Carbonic Acid,	0·600	0·530
Total Soluble in Hydrochloric, but Insoluble in Acetic Acid,	13·766	18·061

Insoluble in Acids.

Silica,	55·314	45·724
Peroxide of Iron,	0·957	1·126
Alumina,	11·182	17·099
Lime,	0·198	0·203
Magnesia,	0·394	0·229
Alkalies and Loss,	0·062	0·468
Total Soluble in Acids,	68·107	64·849
Organic Matter,	13·110	9·720
Water,	4·180	6·310
	100·000	100·000
Ammonia,	0·316	0·084
Equal to Nitrogen,	0.260	0·069
Hygrometric Water,	6·020	8·610

Mechanical Analysis.

Percentage of Gravel,		1·380	0·333
Soil,	Coarse Sand,	53·380	46·120
	Fine Sand,	6·850	5·618
	Clay,	25·180	37·589
	Organic Matter,	13·210	10·340
		100·000	100·000

These analyses present many points of interest, from the fact that they include examples of almost all kinds of soil. Most of them, it is true, belong to the class of what are usually called turnip soils, but among them are the heavy clay of Mr Swanwick's field, which might almost be used for making bricks, the sandy soil of Dirleton, and the light, gravelly, and poor soil of Snawdon. All the soils, with the exception of Mr Swanwick's, were in good condition, and most of them had been long under cultivation, and had been liberally treated, and yet, notwithstanding this, there is very great difference in their natural productiveness. Instances are found among them in which the unmanured plots yield only two or three tons of turnips to the acre, while the manured plots give four or five times this quantity, and others in which the unmanured are not far behind the manured plots. On examining the analyses, it seems pretty clear that this is not always due to the chemical composition of the soil alone, though this, no doubt, has its effect, but depends to no small extent on its mechanical texture. This is certainly the main cause of the small produce in Mr Swanwick's experiments, where the stiffness of the soil was such that no other result could be expected in a season like that of 1866. On the other hand, it is to be noticed that the nothing plots on Mr Shirriff's field, which is a good clay loam, capable of producing excellent crops of all kinds, yield less than those of Mr Hope's

sandy soil, or even Mr Harper's light gravelly soil, the average produce in each case being—

	Tons.	Cwts.
Saltcoats, . . .	4	13
Snawdon, . . .	5	17
Dirleton, . . .	8	6

Now the differences in the chemical composition of the soils will not explain this; for there can be no doubt that the chemist drawing his conclusions from analysis, and the farmer founding on his practical knowledge of the qualities of soils, would concur in the opinion that Mr Shirriff's soil is decidedly superior to the other two. It can scarcely be doubted that it is difference in texture, coupled with the nature of the season, which caused the inferior to surpass the better soils. The wet season was, in fact, favourable to the lighter and more porous soils, through which the water can percolate rapidly, and admit the supplies of air which are necessary to the successful growth of all plants, and unfavourable to the stiffer soils, whose pores remain closed up by the superfluous moisture. The mechanical analyses confirm this view; for the percentage of clay is smallest in Mr Hope's soil, and largest in Mr Shirriff's, while Mr Harper's is intermediate between them. Of course, all this depends on season, for in a dry year it is clear that the clay, owing to its power of retaining moisture, would give the Saltcoats soil a decided advantage over the other two.

It must not be supposed, however, that the productiveness of soil is always, or even often, independent of its chemical composition, for the very reverse of this is the fact; but in the particular case under consideration, all three soils being capable of yielding a sufficient supply of food to the crop, their mechanical state has affected the conditions under which these substances found access to the roots. And it is manifest that this must in all cases exercise a very important influence, for the great mass of the soil is only the vehicle through means of which the actual food is presented to the roots.

The problem which offers the greatest difficulty is, to determine what part of the components of a soil do actually constitute the food of the plants growing upon it. It seems unquestionable that the substances insoluble in acids do not contribute to its immediate fertility; though it is highly probable that the gradual changes which most minerals undergo in the course of time must cause some part of them to pass from a passive to an active state. Even of the portion soluble in acids but a small part is probably accessible to the plant, but the determination of this point is attended with great practical difficulties. The most obvious inference to be drawn from known facts no doubt is, that those

substances which dissolve most readily should be in the most favourable position, but it is by no means clear that this is invariably true. If so, it would necessarily follow that those substances which dissolve readily in water should be most useful. But experience by no means confirms this opinion, for it is not found that plants grow readily in solutions of their essential constituents, although it is possible to make them do so with proper care and precaution. Moreover, soils bring the most essential elements of plants into insoluble or nearly insoluble forms of combination, in which, being attached to the clay and organic matter present in them by a feeble bond, they are kept there ready to supply the wants of the plant. It is far from improbable that the only constituents of the soil capable of passing into the vegetable organism are those which exist in the particular state of combination in question, and which have either been introduced from without, or having been liberated by the action of external agents, such as air and moisture, on the minerals forming the basis of all soils, have been retained in that looser state of combination ready to supply the wants of vegetation.

It is impossible, however, to decide this question in a thoroughly satisfactory manner, because no means are known of separating from one another those portions of the soil constituents which exist in these different states. We can only seek to arrive at some approximation to the solution of the problem, by accumulating knowledge as to the different degrees of solubility of these substances under different conditions, and comparing the results with those obtained in the field, which is necessarily a very slow process, and requires much patience to amass the requisite number of facts, and much self-denial to prevent our attempting to draw conclusions from an insufficient number of data. The determination of the matters dissolved by acetic acid is a step in this direction, which will probably pave the way for a still more minute investigation.

It has been stated at the outset that acetic acid, which is, in fact, more familiar to us as pure vinegar, was selected as the solvent to be applied to the soil, on account of its very feeble affinities, which seemed likely to be more comparable with the action the roots are supposed to exercise on the soils than the more powerful acids, and I propose to direct attention to the quantities of the different substances which it has extracted from the soil. It is necessary to remark, that if a soil of the most fertile kind is boiled two or three times with successive quantities of water, the quantity of matters extracted from it varies from one-tenth to one-third of a per cent., rarely exceeding the latter number—of which one-half at least consists of humus and other organic matters, which are generally understood to be incapable of serving

as nutriment for the plants. Ten thousand parts of soil are then capable of yielding to water from 5 to 15 parts of mineral matter, and even of this but a small proportion consists of those substances which are admitted to be most essential to plants. The potash rarely exceeds 4 or 5 parts in 100,000, and there is no phosphoric acid.

When the soil is treated with acetic acid, the quantity of matters dissolved is much higher, and amounts to from one-half to one and a-half per cent., and to their number phosphoric acid, which rarely appears in the watery solution, comes to be added. It is not found in solution in all cases, but in some soils the quantity dissolved is comparatively large, and sometimes reaches half that which the soil contains. As a rule, the quantity of all the substances dissolved is much larger than in the watery solution. This applies, as might be expected, in an especial degree to lime, which, existing in most soils to a greater or less extent, in the form of carbonate, is readily soluble in acetic acid. Accordingly, we find in some instances all the lime in solution, and rarely less than half the total quantity. The difference in this case must be attributed to the fact, that lime is in most cases an artificial addition to the soil, and the whole quantity so added must readily dissolve in acetic acid; and hence it may be inferred, that those soils in which the whole of the lime dissolves in acetic acid must in their natural state have either contained little or no lime among their mineral constituents, unless, indeed, it was originally derived from some organic source. In Mr Hope's soil, for example, where the lime is entirely soluble in acetic acid, it is highly probable, indeed certain, that part of it is derived from sea-shells. Magnesia, on the other hand, which is not added to the soil artificially, except in those cases in which the land is limed with a lime containing it, is never entirely soluble, and though acetic acid takes it up to some extent, the quantity dissolved rarely exceeds a fourth of that present. The quantity of alkalies, and especially of potash, dissolved, is considerable; and phosphoric acid is also found in the solution in large amount, a half and some times more than that being dissolved.

Acetic acid takes up a smaller proportion of the subsoil, but the solution contains the same substances. Phosphoric acid, however, is more frequently absent than it is in the acetic solutions of the soils. The quantity of soluble lime is also in general perceptibly smaller, though this is not invariably the case.

It may at first sight appear to many, that the quantities of the different elements of plant-food taken up by acetic acid are so small as to afford but an inadequate supply to the plants; but a very little consideration is sufficient to show that, though small relatively to the weight of the soil, the quantity is absolutely

large. Taking the soil of Boysack, which I select as an example because it is of fair quality, and yields, even without manure, a crop of upwards of 12 tons of turnips, it is found to contain 0·101 per cent. of phosphoric acid in the acetic solution. Now, as the upper 10 inches of the surface, which is assumed to represent the soil, weighs at least 1000 tons to the acre, this percentage gives us rather more than a ton of phosphoric acid, which is equivalent to nearly 2·2 tons of phosphates, or it contains as much as 4½ tons of bones. It is manifest that here, supposing the plants can really get possession of it, there can be no deficiency of that constituent, especially if it be taken into account that a crop of 12 tons of turnips only contain 20 lbs. of phosphoric acid. A similar calculation applied to any of the other elements of plant-food leads to similar conclusions; and we are forced to admit, that in every one of the soils analysed, there is a superfluity of the requisite substances.

How is it, then, that certain of these soils in their natural state fail to produce a crop of turnips? and why should the addition of a quantity of manure, containing only 56 lbs. of phosphoric acid to the acre, a quantity absolutely trifling compared with that it already contains, cause so great an increase in the produce in the great majority of instances? The question is one to which we have at present no sufficient answer, and its thorough solution is attended with difficulties which it is only possible to overcome by repeated and long continued experiments. We require especially some information as to the reason why the same manure produces a much greater effect on some soils than on others. There are very remarkable examples of this to be found among the experiments made on these soils. As an illustration, we may select the effects produced by dissolved coprolites and bone ash on the farms of Drylawhill, Boysack, Saltcoats, and Dirleton. These particular manures gave to the acre of land 56 lbs. of phosphoric acid, and the average increase which they yielded per acre over the produce of the plot which got no manure was as follows:—

	TONS.	CWTS.
Drylawhill, . .	1	14
Boysack, . . .	3	16
Saltcoats, . . .	6	10
Dirleton, . . .	9	17

So that the same manures produced nearly six times as great an effect at Dirleton as at Drylawhill, and three times as much as at Boysack. Even under the most favourable circumstances, the increase contains but a small part of the valuable matters which the manure was used to supply. The extra produce on Dirleton must have contained about 16 lbs. of phosphoric acid, while the manure contained 56, so that little more than a fourth of it became

available, and the loss in the other cases is much greater. Now the manure is supplied to the crop under the most favourable circumstances which the farmer can provide. It is placed in the drill near the roots of the plant, and the rain which falls, if not too excessive, conveys it down gradually, so that as the crop grows it should find a supply at the point where it is most required, and yet a large proportion of it is used in vain so far as that year is concerned. It remains in the soil, no doubt, available for future crops, which, doubtless, must sooner or later make use of it, but it is certain that it is then less advantageously employed. The perfection of manuring would be to manage matters so that the crop to which it was applied should exhaust the whole fertilising effect of the manure; but this is a consummation we can never expect to reach in practice, though we are probably destined to approach much nearer it than we now do.

I refrain from entering at the present moment into any detailed discussion of the relation of the soils which have been analysed to one another. The data which are supplied by the experiments of a single season do not afford grounds for forming definite opinions, and any conclusions which we might draw at the present time might be liable to subversion by the results of another season, in which different conditions of weather, &c., may prevail. In conducting such inquiries, the patience is sorely tried, and one is constantly tempted to rush into conclusions which prudence, and the true spirit of scientific investigation, teach us to postpone until a far larger mass of experimental data has been accumulated.

REPORT BY DR ANDERSON ON THE RESULTS OF THE FIELD EXPERIMENTS MADE DURING THE SEASON 1867.

The following pages contain the results of the Field Experiments made under the auspices of the Society during the past season, in continuation of those of the previous year, by experimenters in different districts of the country. These experiments have been conducted on a definite system; and before entering into their details, I think it necessary to premise a few observations as to the principles on which they have been carried out. It is scarcely necessary to observe that the object of all Field Experiments is a practical one. They aim at determining the relative effects of different manures, in such a manner that the farmer may ascertain from them which will give him the maximum amount of produce, with the minimum of outlay consistent with keeping the soil in proper condition. This result may be arrived at, either by making experiments with different well-known manures (which are, for the most part, very complex mixtures), so as to compare with one another their actions on

different soils and crops, and resting content with this information, which, of course, will hold good only for the individual substances used; or by endeavouring to ascertain the mode in which they produce their characteristic actions. In the former case the results are empirical, but they are arrived at with comparative rapidity, so that it is possible, after several years' trial, to say whether, for example, guano, bones, or superphosphate produce the best effect on such and such soils, but they leave us completely in the dark as to how or why they act as they are found to do, or of the effect likely to be produced under circumstances different from those under which the experiments were made. In the latter case the manure is not looked at as a whole only, but we endeavour to trace the mode in which it acts on the oil, and the effect due to each of its constituents, and thus to make, if we may so express it, an analysis of its manurial effects. Experiments conducted in this way for a sufficient length of time to admit of satisfactory generalisations, enable us to decide what part of the total effect of a manure is due to each of its constituents, and to foresee with certainty the result which would be produced if their proportions were altered.

The great difference between these two modes of conducting experiments lies in the fact, that the first, even if conducted only for a single year, offer some kind of conclusions, although they may not be very certain, and may sometimes mislead, while the last require to be continued for some time before any inferences can be drawn from them, and they rarely become valuable until the results of many successive seasons have been accumulated, and compared with one another. As a natural consequence, the former are much more attractive to the experimenter than the latter, because he sees at once to what they lead, and has the pleasant satisfaction of drawing some conclusions from them. The other kind of experiments can only be prosecuted with success by those who profess a real enthusiasm, and who are determined to accumulate the results of many years, during which facts are laboriously accumulated, from which no conclusions can or ought to be drawn until they are sufficiently numerous. The experimenter must therefore exercise much self-denial, and be content to wait patiently for many years; to obtain results which he sometimes cannot understand, or which appear to be irreconcileable; to encounter failures of the most disappointing kind, dependent on causes over which he has no control; and perhaps, after many years devoted to laborious inquiries, he may find that, if he wishes to obtain absolutely conclusive results, he must commence a new series of experiments, so arranged as to clear up the difficulties of those he has already made.

In general the necessity for carrying on experiments for a succession of years is sufficient to deter many from undertaking

them, and they naturally prefer those which give immediate results, of a kind calculated to assist them in the cultivation of their own farms, to those which only add slowly to the general store of knowledge, even though they should for this very reason have a higher *ultimate* importance. The very circumstances which deter individuals from undertaking experiments of this kind are exactly those which recommend them to the attention of an institution like the Highland and Agricultural Society; and when the subject of Field Experiments was taken up in the year 1866, the Committee resolved that, in the first instance at least, their efforts should be devoted to experiments of this description. Accordingly, the experiments of the first season were devoted to the solution of certain fundamental points, and more especially to determining the influence exercised by the particular forms in which the different constituents of manures on their fertilising effects. Thus, for example, it is believed that nitrogen, when in the uncombined state, cannot be assimilated by plants, but that it is absorbed as ammonia. Many manures, however, such as bones for example, contain no ready formed ammonia, but a complex organic compound gelatine, which yields that substance by decomposition, and it is only after that change has occurred that it becomes available to the plant. In sulphate of ammonia, on the other hand, the nitrogen exists in the very state in which it is supposed to be absorbed; and hence the question arises, whether the necessity for a particular change occurring retards the action of the bones, and makes them act more slowly than they would do if they contained ready formed ammonia. It is manifest that this is a matter of great practical importance, and its solution one way or the other might often turn the scale in favour of one or other of the forms in which the farmer uses nitrogen. Of course, weather and the kind of crop to which the manure is applied must manifestly exert a great influence on the result. A dry season, which retards decomposition, and a crop which requires abundance of nitrogen at the outset, are conditions under which it may be anticipated that the ready formed ammonia might surpass that which is not ready for assimilation, while a wet season might put the two substances almost or altogether on a par. Now, in all such experiments, the great point is to use mixtures which shall be strictly comparable; and in last year's experiments this was accomplished by using a manure which supplied the same quantities of soluble phosphates and nitrogen, the latter being in one set in the form of ammonia, and in the other entirely in that of gelatine as it exists in the bones. The substances used were sulphate of ammonia and glue (*i.e.* gelatine identical in chemical nature with the nitrogenous constituent of the bones), and these were applied in such quantity that the nitrogen per acre was the same in both cases. The results of

last year tended to the conclusion that in this respect there is no difference between ready formed ammonia and glue, when applied to the turnip. They went even further, for it appears that when used alone they are absolutely without effect on that crop, except when used on a soil in very high condition—that is to say, charged with the elements of manure—in which case a slight effect is manifest; that they slightly increase the yield when soluble phosphates are associated with them; but in no case is the effect obtained at all proportionate to the amount of nitrogen used; neither can it be said that the ready formed ammonia on the whole surpasses the unformed, but on this point the results of a single season are not sufficient to justify a decided expression of opinion.

The experiments of the season 1866 were further directed to a question much discussed among practical men, namely, whether soluble phosphates derived from mineral sources, such as coprolites, apatite, and the like, are or are not manurially inferior to those which, for convenience' sake, may be said to be of organic origin, such as those contained in guanos and bones. So far as *insoluble* phosphates are concerned, there can, I apprehend, be no difference of opinion, for the hard and compact phosphates of mineral origin are much less accessible than the soft and highly divided substances found in guano; but it is different when they are converted into superphosphates, when the manufacturer, by means of the acid he uses, converts them all into the same compound, and annihilates all the differences which previously existed between them. I have, on this ground, maintained that there ought to be no difference in *soluble* phosphates, from whatever source obtained; but as experiment is necessarily always most convincing, the solution of this question was also made a part of the investigation of 1866.

It had been resolved from the very first by the Field Experiment Committee, that any inquiries undertaken by the Society should be continued on the same plan for several years, so as to eliminate the effect of weather and other disturbing causes. This resolution, however, did not exclude the introduction of such modifications and improvements as the experience of successive years might induce them to adopt, and accordingly, in arranging the experiments for 1867, two very important questions came up for consideration.

The first of these related to the scale on which the experiments should in future be conducted, on which point much difference of opinion prevailed. It was maintained by some of the Committee, that the results obtained on plots of so small a size as $\frac{1}{112}$th of an acre could not be relied upon for indicating what would be obtained on the large scale; others, and among them must be reckoned the greater number of those who had had

practical experience of small experiments, leaned to the opposite opinion. As far as I am myself concerned, I have repeatedly expressed my conviction, that experiments made on a small scale, with proper care and precautions, ought to give as good results as those in which very large plots are employed; but I have always recognised the necessity for putting this opinion to the test by a set of comparative experiments, and in the original scheme drawn up for the Committee such an inquiry was suggested. The propriety of engaging in such a set of experiments was again mooted, but practical difficulties existed in carrying out the proposition at the time, and after mature consideration, the Committee resolved that the small experiments should be continued for another year, leaving the arrangement of set of large and small scale experiments for next season. It was suggested, indeed, by one gentleman, that the latter should in all cases precede the former, as they might often form useful guides to show what should be undertaken on the large scale.

The second matter the Committee had to consider arose out of the particular object of the experiments of 1866. It was urged that, from the very nature of the questions which they proposed to examine, substances not usually employed as manures had been used, and that their interest to the farmer would be largely increased, if, in addition to or instead of these substances, some of the ordinary manures in daily use, such as Peruvian guano, were introduced into the scheme of experiments as points of comparison. The Committee at once recognised the importance of this proposal, and resolved that it should be adopted as far as possible. At the time at which it was made, however, the arrangements were so far advanced, that this could not be done throughout all the experiments, but they were divided into two series, into the second of which Peruvian and Bolivian guanos were introduced as representatives of the two great classes of ammoniacal and phosphatic guanos.

Plan of the Experiments of 1867.

The general object of these experiments was to follow out the line of inquiry of the preceding year, with such modifications as experience dictated, and, as just mentioned, with the addition in certain cases of Peruvian and Bolivian guanos. These objects were,—1st, To compare the effects of ready formed, and what may, for convenience' sake, be called potential ammonia—the former in the state of sulphate of ammonia, the latter in that of glue, the state in which it exists in the bones; 2d, To compare the results obtained from soluble phosphoric acid, in the form of dissolved phosphatic guano and coprolites, these two substances being taken as the best representatives of what we may call animal and mineral phosphates; 3d, To ascertain the effect of

muriate of potash alone and intermixed with other substances on the turnip, and, as already mentioned, to compare these substances with Peruvian and Bolivian guanos, as usually employed.

The system adopted was similar to that used in 1866. The manures were employed in such quantity as to give to the acre of land 112 lbs. of soluble phosphoric acid, 56 lbs. of ammonia, and 56 lbs. of potash. In certain of the trials, however, where ammonia and potash were used together, it was considered that 56 lbs. of each was a quantity so large that it would never be applied in practice, and in these cases 28 lbs. of ammonia and 28 lbs. of potash were used. The mode in which the quantity of the particular manures to be used was ascertained is very simple. Take, for example, the case of the dissolved coprolites; the percentage of soluble phosphoric acid was first determined by analysis, and then by calculation it was ascertained how much of the manure must be used to supply this quantity, and that formed the application for the acre.

The manures employed were—

1*st*, Dissolved phosphatic guano, of which the composition was found to be—

Water,	18·41
Organic matter,	12·99
Biphosphate of Lime, equal to 31·73 Soluble Phosphates,	20·34
Insoluble Phosphates,	12·35
Sulphate of Lime,	31·04
Alkaline Salts,	1·13
Sand,	3·74
	100·00
Ammonia,	0·71

It was intended that in this manure the whole of the phosphates should have been rendered soluble, and it was made with this object, but, unfortunately, when finished it was found that a considerable quantity was insoluble, and as it so happened that no other manure which suited the purpose was to be found in the market at the time, we were under the necessity of using it.

2*d*, Dissolved coprolites.—This sample was found on analysis to contain—

Water,	16·06
Organic matter,	7·69
Biphosphate of Lime, equal to 24·65 Soluble Phosphates,	15·80
Insoluble Phosphates,	10·51
Sulphate of Lime,	45·42
Alkaline Salts,	0·24
Sand,	4·28
	100·00
Ammonia,	0·19

In this case, also, phosphates had been left undissolved, but under the particular circumstances of the case this was not objectionable, as they served to place this and the preceding manure more nearly on a level.

3*d*, Sulphate of ammonia.—This was a good sample, but rather moist. It contained 24·43 per cent. of ammonia.

4*th*, Glue.—It was well-stoved glue, ground under edgestones, in the same manner as that used in the previous years. It contained 13·88 per cent. of nitrogen, equal to 16·85 of ammonia.

5*th*, Peruvian guano.—This was a fair average of the imports at the present time, and contained,—

Water,	14·27
Organic matter and Ammoniacal Salts,	48·98
Phosphates,	22·15
Alkaline Salts,	12·45
Sand,	2·15
	100·00
Ammonia,	14·82
Phosphoric Acid in the Alkaline Salts, equal to 4·48 Phosphate of Lime,	2·05

6*th*, Bolivian Guano, of the kind which has been largely imported during the last eight or ten years, containing—

Water,	8·40
Organic matter and Ammoniacal Salts,	18·55
Phosphates,	61·75
Alkaline Salts,	5·10
Sand,	6·20
	100·00
Ammonia,	0·97
Phosphoric Acid in the Alkaline Salts, equal to 5·70 Phosphate of Lime,	2·62

Both these manures were used just as they are in ordinary cases. In fact, it was neither advisable nor possible to start from a given quantity of any of their useful constituents, and it became necessary to fix the amount to be applied per acre as it would be done on the farm. They were, accordingly, employed at the rate of 7 cwt. per acre, which, though a large, is by no means an excessive application, when they are used without farm-yard manure. It is, I believe, quite customary in such cases for the farmer to use as much as 8 cwt. per acre. These quantities yield per acre the following weights of phosphoric acid and ammonia, in lbs.:—

	Total Phosphoric Acid.	Ammonia.
Peruvian Guano,	95·5	116·3
Bolivian Guano,	242·0	7·1

It is here particularly to be noted that the quantities of these

two substances which are the main fertilising constituents of the manures employed exist in these guanos in very different proportions from those in which they are contained in the artificial mixtures. The Peruvian guano supplies less phosphoric acid, but more than twice as much ammonia as the mixtures, and the Bolivian guano more than twice as much phosphoric acid, but only a trifling quantity of ammonia. The phosphoric acid in the two guanos is, of course, insoluble in water, with the exception of that small quantity which is found in the alkaline salts. In the mixtures only that which is soluble is taken into account. No doubt, it may be urged that the insoluble phosphoric acid must here produce some effect; but this can certainly not be the case with the coprolites; and even with the dissolved guano, I believe it will be found as a rule, that in presence of a large amount of soluble phosphates, that portion which is left undissolved has little effect on the crop to which it is applied, though it no doubt tells to some extent on those which follow.

In weighing out the manures, all the precautions described in my report of last year were adopted. Each manure was taken from the sacks, and the whole well mixed, so that there might be no want of uniformity. The quantity of manure for each individual plot was separately weighed; and where two substances had to be mixed, this was done by weighing each separately, and stirring them together with the hand in a large basin until they were thoroughly mixed.

Along with the manures instructions for sowing, similar to those issued in the previous year, were sent to each experimenter. These I reproduce here, because they contain some precautions which experience showed to be necessary, and they serve also to indicate the exact nature of the experiments.

Instructions for Laying Out the Plots and Sowing the Manures for the Field Experiments of Season 1867.

1. Select a portion of the field in which the soil is as uniform as possible, avoiding headlands.

2. At five or six different places dig a small trench 10 inches deep, and from the side of it take a slice with the spade about 3 or 4 inches thick, as represented here. Mix the whole in a barrow, and take from this 5 or 6 lbs. as a sample of the soil. Go down other 10 inches, and take a similar sample of the subsoil. Small bags and labels for these are sent along with the manures.

3. Let the drills in all cases be 27 inches wide.

4. Fix a stake in the corner of the space selected for the experiments, and having counted the number of drills required for the plots, fix at the opposite end another stake, so that the line

between the two may be at right angles to the drills. It will be found convenient to stretch a string between the stakes, and to let a man walk along treading on the top of the drills, so as to make this line distinctly visible.

5. It is very desirable that the plots should be made two drills wide, with an intermediate space of two drills unmanured, but should circumstances render it necessary, they may be made four or even six drills wide.

6. If two drills be selected as the width, measure off along the drills from each stake a length of 86 feet 4 inches, and, fixing stakes at these points, stretch the string between them, and mark the line as before. Measure off another equal space along the drills, fix stakes, and mark as before. There are thus obtained two parallel spaces, between which any two drills will be $\frac{1}{112}$ of an acre.

Should it be resolved to make the plots four drills wide, the distance between the stakes must be 43 feet 2 inches; and if six drills wide, 28 feet 9 inches.

7. The experiments are in two different series marked 1st Series and 2d Series. One-half of the experimenters receive the manures for the 1st series, the other half those for the 2d.

8. The object of the 1st series of experiments is—1st, To compare soluble phosphates from mineral sources, that is from coprolites with those from guano; 2d, To determine the relative effects of ready formed ammonia and gelatine on the turnip; and 3d, The value of potash mixed with these substances and used alone. In the 2d series of experiments gelatine is omitted, and Peruvian and Bolivian guanos are introduced, so as to afford a point of comparison with ordinary manures as used on the farm.

9. Each series requires in all 28 plots, if 2 nothings be introduced, and 30 plots if (as is to be preferred) there be 4 nothings. They should be arranged as in the subjoined plan, in which the numbers correspond with the manures in the list, the interspaces not being numbered. It is right to state that these interspaces have been introduced this year in consequence of some of the experimenters having found last year that the plots robbed one another.

	Nothing.	1	2	3	4	5	6	13	12	11	10	Nothing.	9	8	7	
	7	8	9	10	11	Nothing.	12	13	6	5	4	3	2	1	Nothing.	

10. The Phosphates are used in such quantity as to supply 112 lbs. soluble phosphoric acid, the sulphate of ammonia and glue, 56 lbs. of ammonia, and the muriate of potash 56 lbs. potash per acre, but when the two latter are used together, the quantity of each is reduced to one half. Peruvian and Bolivian guanos are used at the rate of 7 cwt. per acre.

11. The manures for the 1st series are as follows :—

1. Dissolved Coprolites and Sulphate of Ammonia.
2. „ Guano and do.
3. „ Coprolites and Glue.
4. „ Guano and do.
5. „ Coprolites and Muriate of Potash.
6. „ Guano and do.
7. „ Coprolites with Sulphate of Ammonia and Muriate of Potash.
8. „ Guano and do.
9. „ Coprolites, Glue, and Muriate of Potash.
10. „ Guano and do.
11. „ Coprolites alone.
12. „ Guano alone.
13. „ Muriate of Potash alone.
14. Nothing.

12. The manures for the 2d series are :—

1. Dissolved Coprolites and Sulphate of Ammonia.
2. „ Guano and do.
3. Peruvian Guano.
4. Bolivian Guano.
5. Dissolved Coprolites and Muriate of Potash.
6. „ Guano and do.
7. „ Coprolites with Sulphate of Ammonia and Muriate of Potash.
8. „ Guano and do.
9. Peruvian Guano with Muriate of Potash.
10. Bolivian Guano with Muriate of Potash.
11. Dissolved Coprolites alone.
12. „ Guano alone.
13. „ Muriate of Potash alone.
14. Nothing.

13. The manures are sent out in small sacks, each of which contains the quantity required for a single plot. To the mouth of each sack is attached a metal label with two numbers upon it; the upper refers to the series of experiments, the lower to the number of the plot as given above; and as the plots are all in duplicate, there are in every case two sacks with the same number.

14. Arrange the bags in the order of the plots.

15. Have ready several large stoneware basins (milk basins

will answer). Empty the manure out of one of the bags into a basin, add to it some sand or loam slightly damped, and mix the two carefully with the hand, turning them over several times so as to get them uniformly mixed. From the nature of the manures it will be found that there are great differences in the bulks, and for this reason the quantity of sand used must be so adjusted as to bring all to the same bulk in order to secure accuracy in sowing.

16. Carefully preserve the whole of the bags, and return them at your convenience to 15 Shuttle Street.

17. Three pounds of Aberdeen yellow turnip seed are sent with each lot of manure, being a quantity sufficient to sow one acre.

18. It is desirable that the crop should be singled to a uniform distance of 10 inches.

19. Instructions for weighing the crop, with schedules for recording the results, shall be sent to each experimenter at a later period.

As regards the experimenters of this season, we have been so fortunate as to retain the assistance of most of the gentlemen to whose good work the Society was so much indebted during the previous year. Some gentlemen, however, were prevented by circumstances from giving their services this year, and their places have been filled up by others solicited by the chairmen of the local committees, who are the same as last year—viz., Mr Hope, Fenton Barns; Mr Roberton, Ladyrig; Mr Goodlet, Bolshan; and Mr Drennan, Holmston. The experimenters as finally arranged were:—

East Lothian.

Joseph Harper, Snawdon, Gifford.
George Hope, Fenton Barns, Drem.
John Richardson, Drylawhill, Prestonkirk.
S. D. Shirriff, Salcoats, Drem.

Roxburgh.

J. Dove, Ecclesnewton, Coldstream.
W. Scott, Spylaw, Kelso.
J. Munro, Fairington, Kelso.

Forfarshire.

Alexander Bowie, Mains of Kelly, Arbroath.
Robert Mustard, Leuchlands, Brechin.
T. M. Nicoll, Littleton, Kirriemuir.
W. Smith, West Drums, Brechin.

Ayrshire.

J. Drennan, Holmston, Ayr.
Quinton Bone, Greenan, Maybole.

Among those gentlemen the manures of the first and second sections were divided, so as to have representatives of both in

each district. These experiments have been carried out with the utmost care by the gentlemen to whom they were entrusted, but the extremely unfavourable character of the season caused an unavoidable failure in some cases. Mr Richardson, Drylaw-hill, having sown his on a heavy soil, the result was such that none of the bulbs exceeded a swan's egg in size, and he therefore thought it unnecessary to weigh them. Mr Scott, Spylaw, states that the field in which the experiments were made suffered so much from finger-and-toe as to make the results entirely worthless. These are only instances of the failures which must always take place in all field experiments, especially during a season so unfavourable as that of 1867.

I shall give the details of each series of experiments separately, and append to them a short statement of the most important conclusions to be drawn from them, which it is scarcely necessary to say apply only to the present season.

Experiments of the First Series.

Experiments made by Mr Samuel D. Shirriff, *Salcoats, Drem.*

The field in which these experiments were made is a rather stiff clay. The previous crop was oats after one year's pasture, which was laid down with a wheat crop after potatoes. The land was ploughed during winter, and steam-grubbed in spring. Owing to wet weather during the end of May and two first weeks of June, the land was not in condition for sowing turnips till the 17th, when the experiments were successfully commenced. The land worked very unkindly, having got two much wet, which made it drill up very hard with what, in agricultural parlance, is called too much heel on the top of the drill. The braird was very distinct on 4th July, but during the early part of that month the turnips made but little progress, and were not ready for thinning till just at its close. During August, though the weather was moist, the crop did not thrive, but appeared yellow and sickly, the leaves creeping close to the ground and showing no vigour. Mr Shirriff thinks this is due in part to the variety of turnip, as swedes sown on the 18th June on drills parallel to the experiments, grew luxuriantly and became a fair crop. The turnips were singled by hand, so as to secure regularity of width and the selection of the largest and strongest plants. During October and November they did not thrive. The crop was weighed on the 24th November. The results are contained in Tables I. and II.

Mr Shirriff is of opinion that the unfavourable character of the season has had such an effect on these experiments that little reliance can be placed on them ; and there can be no doubt that

there are very large discrepancies in the results, which it is somewhat difficult to explain. Part of them, however, appear to depend on want of uniformity of the soil. The plots were laid out exactly as represented in the diagram in page 219; that which is there on the left hand being to the north on the field, and on the whole the largest results are on the most northern and eastern plots. Now, it will be noticed that the arrangement of the duplicate plots is made such that, when an average of the two is taken, the errors due to this cause, as far as possible, neutralise one another. Suppose, for example, the soil had been found to be best at what is the left hand side of the diagram, and gradually to diminish in quality towards the right, and this space had been entirely manured in the same way, of course a plot taken in the middle would give the average of the whole, and the same number would be given by the mean of the extreme right and left plots, because the one would be as much above as the other is below the average. In order to secure this, it will be noticed that the duplicates are always placed equidistant from the middle plots, and hence the average of the two ought in all cases to be more correct than either separately. Even with this, however, there are discrepancies which cannot be explained; but still I am inclined to think that some conclusions may be drawn from these experiments, although they must be taken with a certain amount of reservation.

It is noticeable especially that muriate of potash produces but little effect. It adds, no doubt, somewhat to the crop when used alone, but along with coprolites and guano it gives no increase. The largest crop of all, however, is that in which dissolved guano is associated with it and sulphate of ammonia. It appears also that the ready formed ammonia on the whole surpasses the glue.

Experiments made by Mr Dove, *Ecclesnewton.*

These experiments were made on a fair average soil, the previous cropping of which was—1863, yellow turnips manured with 12 loads dung and 3 cwt. of dissolved bones per acre; 1864, barley; 1865, grass pastured; and 1866, oats. The turnips were sown on the 13th June, and the weather was dry for some time after, light showers having fallen on the 22d and on the 4th July. The crop brairded rather unequally. During the month of July much rain fell. The plants were inspected on 2d August, when the nothing plots were observed to be very weak, though on all the others the plants seemed strong. During the remainder of the season the weather was much broken and very disadvantageous to the turnips, which has given a bad yield throughout the whole of Mr Dove's district. The results of his experiments are contained in Tables III. and IV.

The results of these experiments are particularly interesting. In the first place, muriate of potash as used alone is actually prejudicial, diminishing the produce by 2 tons; and it has a similar, though not so decided, an effect when associated with dissolved guano, though along with cropolites it seems to produce a slight increase. Ammonia has no perceptible effect when used along with dissolved coprolites, but has with guano; and the effect of glue seems to be nearly if not quite as good as that of the ready formed ammonia.

Experiments made by Mr Bowie, *Mains of Kelly.*

The field on which these experiments were made had been repeatedly cropped on the six-course shift. In 1865, the crop was beans, heavily manured with farm-yard rough manure on the stubble in autumn, the wheat receiving only a small dressing of fermented bones; and as for the last fifty years the field, when in grass, had never been pastured, but always cut for hay, it was sufficiently weak to be suitable for the object in view. The stubble after wheat received a deep autumn furrow, and a similar cross one in the beginning of May previous to raising the drills. The plots were dressed with the special manures according to the instructions on June 13th, and the seed immediately sown. On the 18th and 19th, the seed began to break cover, and the braird was vigorous over all the plots on the 23d. Severe drought prevailed from this time up to the 3d July, on the morning of which day a slight shower fell. There was copious rain during the night, and the weather continuing moist, great progress was made by the crop. On the 14th, rains amounting almost to floods commenced, and continued up to the 19th. On the 20th, bitterly cold weather commenced, followed by cold dry winds, and the soil being saturated with moisture, growth was much checked, and on the 30th July appearances on the leaves indicated the approach of disease. On wet and heavy lands this went on to finger-and-toe and other diseases, which in many cases ended in the total failure of the crop. In the field in which the experiments were made finger-and-toe was observed in some places, but none of the experimental plots were perceptibly injured by it. All the plots were examined on 29th August. Nos. 7, 8, 9, 10, and 11 appeared pretty equal. Of these No. 8 seemed best, and 11 inferior to any of the others. No. 12, guano alone, inferior. No. 13, in both sections, slightly improved, but not better than the nothings. Nos. 5 and 6 presented a medium appearance. Nos. 4, 3, 2, and 1, superior, and uniform in each of their sections; No. 2, however, in sect. 2d, showing most leaf, and ultimately, when weighed, proved heaviest both in roots and tops; the discrepancy ($3\frac{1}{2}$ tons) between it and the same No. in sect. 1, may be accounted for *in so wet a*

season from the fact that No. 2 in Sect. 2 stood on slightly elevated dry ground, whilst that No. in Sect. 1 stood lower and on *slightly* damper soil naturally, the two plots being at opposite corners of the sections. These plots produced, particularly in Sect. 2, coarse, *ungainly* bulbs, with thick-necked tops; whilst those containing coprolites, &c., &c., were handsome in these respects, the bulbs being more globular. The plots were all weighed, roots and tops separately, on the 16th and 17th Dec., in a uniformly dry state, and in the most careful manner, the number of bulbs in each plot being at same time counted. The following table gives the rainfall of the district from the careful observations of Mr Alexander Brown, Arbroath:—

Rainfall and Temperature at Arbroath.

1867.	Rain in Inches.	Mean Tem. in 1867.	Mean Tem. of 22 years.
June, . . .	1·367	55·9°	55·4°
July, . . .	4·692	54·0	59·8
August, . .	2·783	58·6	57·2
September, . .	1·748	55·7	53·4
October, . .	2·051	47·6	47·8
November, . .	0·481	42·5	40·4
	13·122 Total of 6 Months.	52·8 Mean of 6 Months.	52·7 Mean of 22 Years.

Two curious facts are here brought out, and which are extremely interesting, viz., that notwithstanding the low temperature of last summer—spoken of in a general way—it is quite or within the smallest fraction of being equal to the temperature of the same six months of the last twenty-two years. Again, Mr Brown's table shows, in connexion with the admittedly deficient crop of 1867, the fallacy of trusting to averages. In fact, the disasters of the year are clearly traceable to the month of July, with its excessive rainfall and low temperature. June, August, and September were above the average temperature of the last twenty-two years, and it cannot be doubted that it was July which did all the mischief.

The results of Mr Bowie's experiments are contained in Tables V. and VI.

These experiments are in all respects most satisfactory, and the conclusions to be drawn from them are peculiarly interesting. The most prominent point is, again, the absence of all effect from muriate of potash, whether employed alone or associated with other substances. Only in the case of dissolved guano along

with muriate is there any increase worth noticing, and then it is only to the extent of a single ton. It is worthy of notice, however, that the largest result is attained where guano, sulphate of ammonia, and muriate of potash are applied together; but the increase over the same manure, and ammonia alone, is trifling. In this case it must be borne in mind that in plot 8 the quantity of ammonia is only half as large as in plot 2; and it might therefore be alleged that the muriate of potash produced the same effect as the sulphate of ammonia, which it replaced. But this view can scarcely be maintained in the face of the entire absence of effect in other cases. It is much more probable that it is due to the quantity of ammonia contained in the manure, when that substance is used alone, being in excess of the requirements of the crop. In point of fact, the evidence both of last and this year's experiments tends to show that the effect of ammonia on the turnip is comparatively small. Thus, in the experiments before us, phosphoric acid doubles the crop, and ammonia only adds 3 tons per acre more, and this quantity requires only 15 lbs. of ammonia, while the manure contained 56. It is also interesting to notice, that there is no appreciable difference between glue and ready-formed ammonia.

Experiments made by Mr SMITH, *West Drums, Brechin.*

The field in which these experiments were made is a light black soil on the Old Red Sandstone, in fair cultivation and condition. It had been pastured for three years, after which two crops of oats had been taken, the second of which got 2 cwt. of guano per acre. The land was prepared in the usual way, and sown on the 20th June. The crop brairded regularly, and was thinned on the 13th July. The plots continued to grow pretty equally, except No. 13, which at no time surpassed the nothing plots, and ultimately fell behind them. The season was unfavourable to turnips throughout. The crop was weighed on 28th December, and the results are contained in Tables VII. and VIII.

These experiments give very concordant results, and the conclusions they lead to correspond generally with those which preceed. Muriate of potash alone has no effect, but when associated with other substances appears to produce a slight increase. It does so along with soluble phosphates to a slight extent, but the largest crops are produced when these two substances and ammonia are conjoined. Glue likewise produces as good an effect as the ready-formed ammonia.

Experiments made by Mr DRENNAN, *Holmston, Ayr.*

The experiments were made on a rather heavy loam, which was selected on account of its apparent uniformity of quality.

The land was under turnips in 1862, and was then pretty well manured with town dung, guano, and dissolved bones. It has since yielded wheat in 1863, pasture in 1864 and 1865, and oats in 1866. It is middling land as regards natural fertility, and was in fair condition last year.

The manures were applied and the seed was sown on the 14th of June. The soil was in good tilth, and the braird came up pretty regularly. The turnips were ready for thinning on the 14th of July, but the work was delayed till the 18th by unfavourable weather.

At that stage Nos. 1, 2, 4, 5, 11, and 12 of section first were the most forward plots, and 6, 7, 8, and 9 did not look so well. The lots with nothing marked themselves out distinctly. Nos. 1, 11, and 12 of the second section were not in advance of the other plots.

The weather was most unfavourable after the date of thinning. Heavy falls of rain and cold nights checked the growth, and the young plants changed from a promising look at the middle of July to a stinted aspect at the end of the month. The fine weather in August restored the plants wonderfully, but on heavy land an important part of the season for growth had passed away.

Although the soil of the experimental plots has a uniform appearance, and it yields very equal crops in ordinary seasons, it became evident after the heavy rains that the second section of experiments would be less satisfactory than the first. The plants sustained more injury on some of the plots than others. Nos. 1, 2, 7, and 8 appeared to suffer most in this way from the character of the soil. This disturbing cause, which was more or less perceptible on many of the plots, must always lessen the value of experiments on such lands in an adverse season. (See Tables IX. and X.)

In these experiments Mr Drennan has not weighed the leaves, an omission which in this case does not appear of much importance. It is obvious, indeed, that the long-continued rains of July had so much injured the plants as to deprive the experiments of much of the value they would otherwise have had. In one respect, however, the result is very striking and unexpected, for here muriate of potash produces a very decided effect, and even surpasses the ordinary manures, containing abundance both of phosphoric acid and ammonia. It is difficult to find any explanation of this result, especially when it is noticed that no similar effect is produced by it along with other manures, as for example, no plot (6) where the produce from it and phosphates is less than in No. 12, where the same phosphates are employed alone.

Experiments made by Mr Munro, *Fairnington, Kelso.*

These experiments were made on plots of four drills wide, with one blank drill. The crop was sown on the 19th June, and was well sprung by the 27th. On the 11th July the plants were singled. The plots were twice inspected during the season, but the difference in the lots receiving the different manures were too slight to merit recording. The only exception to this was on No. 13, which did not surpass the nothing plots. The crop was weighed on the 10th February, severe weather having prevented its being done sooner. The leaves were then a good deal decayed, and some of the bulbs slightly injured by wood pigeons. (See Tables XI. and XII.).

The conclusions to be drawn from these experiments on the whole bear out those of the other experimenters. Muriate of potash alone has no effect, but when associated with sulphate of ammonia and glue, it does produce a distinct addition to the crop.

Experiments of the Second Series.

These experiments were conducted in a similar manner to the first series, excepting that glue was discarded, and Peruvian and Bolivian guanos introduced in its place. All the plots, therefore, were manured in exactly the same manner as in the first series, with the exception of Nos. 3, 4, 9, and 10. Nos. 3 and 4 were manured respectively with Peruvian and Bolivian guanos alone, and Nos. 9 and 10 had, in addition, muriate of potash enough to supply 56 lbs. of potash per acre. The latter substance was used in order to test its effect as an addition to ordinary manures. At the present time a good many manures are offered for sale containing muriate of potash, or more frequently sulphate of potash, to the extent of 5 or 6 per cent., and as there is at present no very distinct information as to the effect of this addition, it was thought that some information on this head might be brought out.

Experiments made by Mr Hope *at Fenton Barns.*

These experiments were made on a thin clay loam or trap rock. It is not strong land, but has a tendency to run together when wet. During the early part of June the weather was very wet, 2·3 inches of rain having fallen between the 1st and 15th, on which latter day the crop was sown. The soil was in fine condition for turnip-sowing, and with plenty of moisture to secure a quick braird, which accordingly showed itself on the 24th. On the 13th July all the plots were horse-hoed or grubbed. The nothing plots were much paler in colour, but nearly as well grown as the others. Nos. 2 and 8 had the largest leaves and

darkest colour, and No. 1 stood next. The crop was singled on the 15th. The 16th was very wet, and much rain fell during the remainder of the month, the total rainfall of July having amounted to 6·6 inches, which is far above the average. During August the weather was showery, 2·2 inches of rain having fallen, but the turnips made comparatively little progress. September was very dry, the rainfall being under 1 inch: the land was as hard as iron, and but little growth on the crop. In October the turnips grew considerably, but were still a poor crop. Rain, 1·5 inches. November was very dry, only 0·5 inch having fallen, and the leaves of the turnips became yellow and mildewed. The crop was weighed on 17th December, and the results are contained in Tables XI. and XII.

In these experiments the effects of the manures are not so well marked as in many others, the soil itself having obviously been in good condition, and producing, even without manure, a comparatively considerable amount of turnip. The crop, however, is small. As on previous occasions, scarcely any effect is produced by muriate of potash when alone, and the same applies in all cases to the purely phosphatic manures. Dissolved coprolites and dissolved guano, whether alone or with muriate of potash, produce a trifling effect, and even ordinary Bolivian, on which farmers in many districts rely with confidence for raising a good crop of turnips, gives only an increase of 7 cwt. when used alone, and 16 cwt. when associated with muriate of potash. The case is very different, however, when nitrogenous matters enter into the manure. The produce then immediately increases, and Peruvian guano, which, with less phosphates, contains nearly twice as much ammonia as any of the other applications, gives the best result.

Experiments made by Mr HARPER, *Snawdon, Gifford.*

The experimental plots of this set of experiments were sown on the 15th June, under favourable circumstances, on a field 750 feet above the level of the sea, with a northern exposure. The soil is light and free, and well suited for the growth of turnips and barley. The crop was fully brairded by the 24th, at which time no difference could be detected between any of the plots, the nothings coming away as freely as the others. The crop was singled on the 15th July, at which time the nothing plots, and those which got Peruvian and Bolivian, guano were markedly inferior to the others. All the plots which got the muriate of potash, on the other hand, were superior in vigour and freshness. Up to this time the, weather though dry, had been mild and warm, and very conducive to the growth of the turnip on high land, but rain fell on the 14th and 15th July. From this time to the beginning of September, the weather, though broken, was on the whole decidedly

too dry for the turnip; and the consequence was, that the crop in Mr Harper's district was under the average, as it was also on the experimental plots. The turnips made considerable progress during November, and Mr Harper thinks they might have continued to do so for some time had they been left on the field, but as there was severe frost in the beginning of December, he thought it safer to lift and weigh the produce on the 10th of that month. The results are given in Tables XIII. and XIV.

The results of these experiments are extremely remarkable, especially as regards muriate of potash. Alone, it adds above 7 tons to the produce; but when used with phosphates, it hardly produces a perceptible effect. Thus, with coprolites it only adds about a ton to the quantity which that substance gives alone, and with dissolved guano the result is about 6 cwt. less. So likewise phosphates with ammonia produce but little more than when alone. But it is quite otherwise when phosphates, ammonia, and muriate of potash are conjoined. Then a marked increase is observed; and where the phosphates are derived from dissolved guano, the highest crop is obtained, the quantity reaching 20 tons per acre. Next to this stands Peruvian guano, only a slight advantage being gained by the addition of muriate of potash; while Bolivian guano is much behind, and does not surpass soluble phosphates employed alone, although supplying a much larger quantity of phosphoric acid.

Experiments made by Mr MUSTARD, *Leuchland, Brechin.*

The piece of ground selected for these experiments is a light loam resting on a mixture of inferior clay and sand, situated about 140 feet above the level of the sea. The field has been cropped for a good many rotations under the five-shift system. The soil got a fair furrow in December, and the grubber was put over it on the 20th May, and it was well harrowed immediately after. The weather became very wet on the 27th May, and continued showery for ten or eleven days. On the 10th June it was again grubbed, with common harrows following; and the day after, the chain-harrows were used. On the 14th June it was rolled and drilled, and on the 15th it was sown under favourable circumstances. Scarcely any rain fell from the time of sowing up to the 2d July; but the weather was on the whole favourable, and on the latter day a nice equal braird had appeared all over the plots. Rain fell on 3d and 4th July, but from that time to the 13th, when a slight shower fell, the weather was bright and warm, with strong sun. On the 13th all the plots were singled, with the exception of Nos. 0 and 13. On the 15th and 16th heavy rain fell, and all out-of-door work was stopped. On the 18th there was again wind and rain, and the ground was so thoroughly saturated that water stood between the drills. Up to

the 23d showers fell every day, and the temperature was low, so that the turnips made scarcely any progress. On the 25th Nos. 0 and 13 were thinned. Up to the middle of August the weather remained very variable, and finger-and-toe had made its appearance in many fields in the neighbourhood, and to some extent on the experimental plots, though on the whole they seemed to be doing tolerably well. On the 19th and 20th August much rain fell, and the ground was thoroughly saturated with moisture. After this the weather on the whole was more favourable. Finger-and-toe, however, made considerable progress, and Mr Mustard believes that it damaged the result of the crop to the extent of nearly a third. At the time of singling there were from 200 to 220 bulbs in each plot, and a comparison of them with the number of bulbs weighed, as recorded in the Table, will give some idea of the injury done by the disease. The crop was weighed on the 9th January. (See Tables XV. and XVI.)

Although the existence of finger-and-toe in these experiments necessarily takes to some extent from their value, it is interesting to notice that the conclusions to be drawn from them are precisely in accordance with those deduced from the majority of the other experiments. Muriate of potash, alone, fails utterly; with phosphates it produces scarcely any effect—none at all, indeed, in No. 5, though No. 6 shows a very decided increase; but along with both phosphates and ammonia it gives the two highest crops in Nos. 7 and 8, and the next highest in No. 9, where it is used along with Peruvian guano. Bolivian guano, whether with or without muriate of potash, gives no higher result than soluble phosphates alone. It is worthy of notice that when sulphate of ammonia is added to coprolites it increases the produce; but with dissolved guano it has no similar effect.

Experiments made by Mr Nicoll, *Littleton, Kirriemuir.*

The piece of ground selected for these experiments was above the average of the field. The previous crop was oats, after three-year-old lea, pastured the first year by cattle, and the others by sheep. When last under green crop it was potatoes.

The land was early ploughed with a medium furrow; cross-ploughed in spring; the drills formed and harrowed down two weeks previous to being seeded. The experimental plots were sown on the 15th June, under favourable circumstances, both as regards state of soil and weather, for producing an early and equal braird. They were all visible above ground on the 23d, and thinned on the 11th and 12th of July. The produce was weighed on the 11th and 12th December. Although, while growing, the plants appeared tolerably healthy, when pulled decided symptoms of *finger-and-toe* were observable, which would doubtless have

seriously extended and increased had not the wet weather induced a vigorous growth.

The plots Nos. 2 and 13 were particularly unhealthy, especially the latter. In this plot not only were the plants very deficient, but those remaining were very unhealthy. (See Tables XVII. and XVIII.)

The results in this case again prove unfavourable to muriate of potash used alone; but associated with phosphates it is not without effect, raising the produce in No. 5 slightly, and in No. 6 decidedly above that of the same manure without it; and when ammonia is used in addition, the highest crops are obtained. Ammonia along with phosphates has scarcely any effect; and Peruvian guano, whether with or without muriate of potash, gives just the same result as the soluble phosphates alone, and less than Bolivian guano with muriate of potash.

Experiments made by Mr Quintin Bone, *Greenan, Maybole.*

These experiments were made on an ordinary soil. The turnips were sown on the 20th June, the weather being dry and favourable. They were thinned on the 2d August, and weighed on the 25th December. All the observations made regarding the weather in Mr Drennan's experiments apply to these. As the season advanced, Mr Bone found that the plots in the second section were so irregular that no result could be obtained from them, and he has therefore omitted them from his report, which is a matter of regret, as necessarily the results are much less valuable than they would have been had there been a duplicate. The results are contained in Tables XIX. and XX.

The results, it will be seen, are here quite in accordance with most of the others. Muriate of potash, alone, has no effect, nor have soluble phosphates alone; but together, a slight effect is apparent. Phosphates with ammonia, however, produce a very marked effect, and Peruvian guano stands highest of all when used alone, but is lower when muriate of potash is added.

The remarks which are appended to each of these sets of experiments are sufficient to enable the reader to form some idea of the nature of their results, and I shall not attempt here any minute discussion of the conclusions to be deduced from them. To do so, indeed, would be to trench upon what ought to be left for the future. The great object of such experiments is rather to accumulate facts which can be afterwards more satisfactorily discussed, and to avoid, as far as possible, those hasty conclusions which we are too apt to draw from the inquiries of a single season. It is impossible, however, to exclude some observations upon them, for there are a few conclusions to which they point with some distinctness.

The most conspicuous point is the general absence of effect from muriate of potash. In only two cases does it raise the produce above that of the nothing plots. In most it is nearly the same, and in one or two it is actually diminished. It is impossible at the present moment to determine the cause of its effect in the first two cases, but it seems very clear that the whole balance of evidence is against the use of muriate of potash alone. When mixed with phosphates, also, its effect is generally unfavourable, or at all events it is so uncertain that no reliance can be placed upon it. But when both these substances are used along with ammonia, the effect, though not invariable, is generally very good, and some of the largest crops have been got in this way.

This fact recalls to mind the results obtained last year by the use of nitrogenous manures alone, which were so entirely nugatory as to render it, in the opinion of the committee, unnecessary to try them this year. It appears, indeed, very obvious that the use of a single fertilising ingredient, alone, is rarely of much service, and that in all cases the best effect is produced by the mixture of several. It is no doubt for this reason that the farmer generally obtains his best crops from mixtures of manures, the one supplying what the other is deficient in.

As regards the effect of nitrogenous manures in this year's experiments, where they are used only with other substances, it is in many cases insignificant, and the ready-formed ammonia certainly does not surpass that existing in the form of glue. In two sets of experiments, Peruvian guano, the most highly nitrogenous mixture used, gives the best effect; but in other instances it does not stand so high, though it generally gives a good result.

It is interesting to notice how greatly the productive capacity of the soil has varied, as indicated by the produce of the nothing plots, showing that soils of very different kinds, and in different conditions, have been used for the experiments, and this, it is scarcely necessary to say, is a most important feature in such experiments, because it is only by this means, and by continuing them until a sufficient number have accumulated, that we can hope to trace out the influence which the character of the soil has on the amount and quality of the crop.

I refrain at the present time from discussing more at length the minutiæ of these experiments, lest I should be led farther than facts warrant. I do not doubt that those who study them carefully will find in them much that is of interest, and agree with me in the opinion that the best thanks of the Society are due to the gentlemen who have expended so much time and labour and accuracy in conducting them.

TABLE I.—Giving the Results of the First Series of Experiments made at Saltcoats.

No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.
N_1.			1.			2.			3.			4.			5.			6.			N_2.			7.			8.		
...	57	21	...	105	30	...	87	28	...	133	31	...	122	36	...	108	28	...	118	30	...	...	...	...	129	31	...	168	36
9.			10.			11.			12.			13.			N_3.			1.			2.			3.			4.		
...	158	37	...	138	36	...	154	37	...	112	33	...	98	31	...			...	200	63	...	201	59	...	182	54	...	148	42
5.			6.			7.			N_4.			8.			9.			10.			11.			12.			13.		
...	156	56	...	173	49	...	142	42	...	112	45	...	155	44	...	142	42	...	158	44	...	154	56	...	158	42	...	121	42

TABLE II.—Arranged Plan of the First Series of Experiments made at Saltcoats, giving the Produce in Lbs. per Plot or Cwts. per Acre, with the Average of the Two Sections in Tons. and Cwts.

	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.
	N.				1.				2.				3.				4.				5.				6.			
Section I.,	57	21	78	36·8	105	30	135	28·5	87	28	115	32·1	133	31	164	23·3	122	36	158	29·5	108	28	136	25·9	118	30	148	25·4
Section II.,	112	45	157	40·1	200	63	263	31·5	201	59	260	29·3	182	54	236	29·6	148	42	190	28·5	156	56	212	35·9	173	49	222	28·3
Total, .	169	66	235	76·9	305	93	398	60·0	288	87	375	61·4	315	85	400	52·9	270	78	448	58·0	264	84	348	61·8	291	79	370	53·7
Average, .	84·5	33	117·5	38·4	192·5	46·5	199	30·0	144	43·5	187·5	30·7	157·5	42·5	200	26·4	135	39	224	29·0	132	42	174	30·9	145·5	39·5	185	26·8
Average per Acre in tons and cwts.,	Bulbs. 4 4·5		Leaves. 1 13		Bulbs. 9 12·5		Leaves. 2 6·5		Bulbs. 7 4		Leaves. 2 3·5		Bulbs. 7 17·5		Leaves. 2 1·5		Bulbs. 6 15		Leaves. 1 19		Bulbs. 6 12		Leaves. 2 2		Bulbs. 7 5·5		Leaves. 1 9·5	

	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.
	7.				8.				9.				10.				11.				12.				13.			
Section I.,	129	31	160	24·0	168	36	204	21·4	158	37	195	23·4	138	36	174	21·4	154	37	191	24·0	112	33	145	29·4	98	31	129	31·6
Section II.,	142	42	184	29·5	155	44	209	28·5	142	42	184	29·5	158	44	202	27·8	154	56	210	36·3	158	42	200	26·5	121	42	163	34·7
Total, .	271	73	344	53·5	323	80	413	49·9	300	79	379	52·9	296	80	376	49·2	308	93	401	60·3	270	75	345	55·9	219	73	292	66·3
Average, .	135·5	36·5	172	26·7	161·5	40	206·5	24·9	150	39·5	189·5	26·4	148	40	188	24·6	154	46·5	201	30·1	135	37·5	172·5	27·9	109·5	36·5	146	33·1
Average per Acre in tons and cwts.,	Bulbs. 6 15·5		Leaves. 1 16·5		Bulbs 8 1·5		Leaves. 2 0		Bulbs. 7 10		Leaves. 1 19·5		Bulbs. 7 8		Leaves. 2 0		Bulbs. 7 14		Leaves. 2 6·5		Bulbs. 6 15		Leaves. 2 17·5		Bulbs. 5 9·5		Leaves, 1 16·5	

TABLE III.—Giving the Results of the First Series of Experiments made at Eccles Newtown.

No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.
N_1.			1.			2.			3.			4.			5.			6.			N_2.			7.			8.		
202	154	42	200	242	50	232	280	52	192	246	50	210	256	53	218	244	37	200	196	35	204	188	44	218	226	53	208	174	43
9.			10.			11.			12.			13.			N_3.			1.			2.			3.			4.		
196	212	36	182	246	48	202	232	42	204	246	52	194	132	35	214	128	50	190	192	57	172	228	53	156	196	56	186	224	70
5.			6.			7.			N_4.			8.			9.			10.			11.			12.			13.		
172	208	49	176	202	52	200	210	57	200	116	45	192	222	55	230	210	60	184	154	42	192	194	56	186	180	48	146	80	33

TABLE IV.—Arranged Plan of the First Series of Experiments made at Eccles Newtown, giving the Produce in Lbs. per Plot or Cwts. per Acre, with the Average of the Two Sections in Tons and Cwts.

	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.
	N.				1.				2.				3.				4.				5.				6.			
Section I.,	171	43	214	25·1	242	50	292	20·6	280	52	332	18·5	246	50	296	24·3	256	53	309	20·7	244	37	281	15·1	196	35	231	17·8
Section II.,	122	47½	169½	38·9	192	57	249	29·6	228	53	281	23·2	196	56	252	28·5	224	70	294	31·2	208	49	257	23·5	202	52	254	25·7
Total, .	293	90½	373½	30·8	434	107	541	24·6	508	105	613	20·6	442	106	548	23·9	480	123	603	25·6	452	86	538	19·0	398	87	485	21·8
Average, .	146½	45¼	186¾	30·8	217	53½	270½	24·6	254	52½	306½	20·6	221	53	274	23·9	240	61½	301½	25·6	226	43	269	19·0	199	43½	242½	21·8
Average per Acre in tons and cwts.,	Bulbs.		Leaves.		Bulbs.		Leaves.		Bulbs.		Leaves.		Bulbs.		Leaves.		Bulbs.		Leaves.		Bulbs.		Leaves.		Bulbs.		Leaves.	
	7	6½	2	5¼	10	17	2	13½	12	14	2	12½	11	1	2	13	12	0	3	1½	11	6	2	3	9	19	2	3½

	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.
	7.				8.				9.				10.				11.				12.				13.			
Section I.,	226	53	279	23·4	174	43	217	24·7	212	36	248	16·9	246	48	294	19·5	232	42	274	18·0	246	42	288	17·0	132	35	467	26·5
Section II.,	210	57	267	27·1	222	55	230	24·7	210	60	270	28·5	154	42	196	27·2	194	56	250	28·8	180	48	228	26·6	80	33	113	41·2
Total, .	436	110	546	25·2	396	98	447	24·7	422	96	518	22·7	400	90	490	22·5	426	98	524	23·0	426	90	516	21·1	212	68	280	30·0
Average, .	218	55	273	25·2	198	49	223½	24·7	211	48	259	22·7	200	45	245	22·5	213	49	262	23·0	213	45	258	21·1	106	34	140	32·0
Average per Acre in tons and cwts.,	Bulbs.		Leaves.		Bulbs.		Leaves.		Bulbs.		Leaves.		Bulbs.		Leaves.		Bulbs.		Leaves.		Bulbs.		Leaves.		Bulbs.		Leaves.	
	10	18	2	15	9	18	2	9	10	11	2	8	10	0	2	5	10	13	2	9	10	13	2	5	5	6	1	14

TABLE V.—Giving the Results of the First Series of Experiments made at Mains of Kelly.

No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.
N_1.			1.			2.			3.			4.			5.			6.			N_2.			7.			8.		
190	157	44	212	350	84	208	330	82	210	359	87	206	369	86	208	332	62	205	342	69	181	177	44	214	385	81	205	385	76
9.			10.			11.			12.			13.			N_3.			1.			2.			3.			4.		
207	383	83	204	375	79	211	313	72	209	267	61	184	168	46	190	144	42	210	371	81	210	400	95	202	371	86	201	351	82
5.			6.			7.			N_4.			8.			9.			10.			11.			12.			13.		
210	301	68	208	274	55	211	349	67	203	161	39	208	366	67	212	330	57	210	346	73	212	306	70	199	310	67	188	135	36

TABLE VI.—Arranged Plan of the First Series of Experiments made at Mains of Kelly, giving the Produce in Lbs. per Plot or Cwts. per Acre, with the Average of the Two Sections in Tons and Cwts.

	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.
	N.				1.				2.				3.				4.				5.				6.			
Section I.,	167	44	211*	26·3	350	84	434	24	330	82	412	24·8	359	87	446	24·2	369	86	455	23·3	332	62	394	18·6	342	69	411	20·1
Section II.,	152	40	192*	26·3	371	81	452	21·8	400	95	495	23·7	371	86	457	23·1	351	82	433	23·3	301	68	369	22·5	274	55	329	20
Total, .	319	84	403	...	721	165	886	...	730	177	907	...	730	173	903	...	720	168	888	...	633	130	763	...	616	124	740	...
Average, .	159	42	201	26·3	360	82	443	22·9	365	88	453	24·2	365	86	451	23·6	360	84	444	23·3	316	65	381	20·5	308	62	370	20
Average per Acre in tons and cwts.,	Bulbs. 7 19		Leaves. 2 2		Bulbs. 18 0		Leaves. 4 2		Bulbs. 18 5		Leaves. 4 4		Bulbs. 18 5		Leaves. 4 6		Bulbs. 18 0		Leaves. 4 4		Bulbs. 15 16		Leaves. 3 5		Bulbs. 15 8		Leaves. 3 2	
	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.
	7.				8.				9.				10.				11.				12.				13.			
Section I.,	385	81	466	21	385	76	461	19·8	383	83	466	21·6	375	79	454	21	313	72	385	23	267	61	328	22·8	168	46	214	27·4
Section II.	349	67	416	19·2	366	67	433	18·1	330	57	387	17·3	346	73	419	21	306	70	376	22·8	310	67	377	21·6	135	36	171	26·6
Total, '	734	148	882	...	751	143	894	...	713	140	853	...	721	152	873	...	619	142	761	...	577	128	705	...	303	82	385	...
Average, '	367	74	441	20·1	375	71	447	19	356	70	426	19·5	360	76	436	21	309	71	380	22·9	288	64	352	22·2	151	41	192	27
Average per Acre in tons and cwts.,	Bulbs. 18 7		Leaves. 3 14		Bulbs. 18 15		Leaves. 3 11		Bulbs. 17 16		Leaves. 3 10		Bulbs. 18 0		Leaves. 3 16		Bulbs. 15 9		Leaves. 3 11		Bulbs. 14 8		Leaves. 3 4		Bulbs. 7 11		Leaves. 2 1	

* Averages of the Two Nothings in each Section are here given.

TABLE VII.—Giving the Results of the First Series of Experiments made at Mains of Kelly,

TABLE VII.—Giving the Results of the First Series of Experiments made at West Drums, Brechin, Forfarshire.

No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.
N_1.			1.			2.			3.			4.			5.			N_2.			7.			8.	
...	5·1	2·8	...	10·19	4·12	...	10·8	4·1	...	12·9	5·19	...	11·3	4·18	...	10·3	3·18	...	5.1	2·8	...	11·18	3·4	...	12·13	4 1
9.			10.			11.			12.			13.			N_3.			1.			2.			3.		
...	11·9	3·6	...	12·4	3·1	...	11·14	3·18	...	9·18	3·9	...	5·14	3·2	...	5·1	2·8	...	11·6	4·4	...	11	5·7	...	10·1	3·14	...	10·18	3·17
5.			6.			7.			N_4.			8.			9.			10.			11.			12.			13.		
...	12·7	3·7	...	10·7	2·18	...	12·10	5·1	...	5·1	2·8	...	12·18	5·7	...	12	4·19	...	11·12	3·19	...	9·5	3·5	...	9·5	2·15	...	3·15	1·18

TABLE VIII.—Arranged Plan of the First Series of Experiments made at West Drums, giving the produce in Lbs. per Plot or Cwts. per Acre, with the Average of the Two Sections in Tons and Cwts.

	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.
	N.				1.				2.				3.				4.				5.				6.			
Section I.,	104	51	155	...	219	92	311	...	208	81	289	...	249	119	368	...	223	98	321	...	203	78	281	...	222	89	311	...
Section II.,	98	46	144	...	226	84	310	...	220	107	327	...	201	74	275	...	218	77	295	...	247	67	314	...	207	58	265	...
Total, .	202	97	299	...	445	176	621	...	428	188	616	...	450	193	643	...	441	175	616	...	450	145	595	...	429	147	576	...
Average, .	101	48	149	47·5	222	88	310	39·6	214	94	308	43·9	225	96	321	42·6	220	87	308	49·5	225	72	297	32	214	73	288	34·1
Average per Acre in tons and cwts.,	Bulbs.		Leaves.		Bulbs.		Leaves.		Bulbs.		Leaves.		Bulbs.		Leaves.		Bulbs.		Leaves.		Bulbs.		Leaves.		Bulbs.		Leaves.	
	5 1		2 8		11 2		4 8		10 14		4 14		11 5		4 16		11 0		4 7		11 5		3 12		10 14		3 13	

	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.
	7.				8.				9.				10.				11.				12.				13.			
Section I.,	238	64	302	...	253	81	334	...	229	66	295	...	244	74	318	...	234	78	312	...	198	69	267	...	114	62	176	...
Section II.,	250	101	351	...	258	107	365	...	240	99	339	...	232	79	311	...	185	65	250	...	185	55	240	...	75	38	113	...
Total, .	488	165	653	...	511	188	699	...	469	165	634	...	476	153	629	...	419	143	562	...	383	124	507	...	189	100	289	...
Average, .	244	82	326	33·6	255	94	349	36·8	234	82	317	35	238	76	314	31·9	209	71	281	33·9	191	62	253	32·4	94	50	144	53·2
Average per Acre in tons and cwts.,	Bulbs.		Leaves.		Bulbs.		Leaves.		Bulbs.		Leaves.		Bulbs.		Leaves.		Bulbs.		Leaves.		Bulbs.		Leaves.		Bulbs.		Leaves.	
	12 4		4 2		12 15		4 14		11 14		4 2		11 18		3 16		10 9		3 11		9 11		3 2		4 14		2 10	

TABLE IX.—Giving the Results of the First Series of Experiments made at Holmston, near Ayr.

No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.
N_1.			1.			2.			3.			4.			5.			6.			N_2.			7.			8.		
...	77	...	...	273	...	...	267	...	...	174	...	...	208	...	...	262	...	...	183	...	...	32	...	...	232	...	...	180	...
9.			10.			11.			12.			13.			N_3.			1.			2.			3.			4.		
...	236	...	...	241	...	...	183	...	...	245	...	...	203	...	...	27	...	...	194	...	...	227	...	...	152	...	...	187	...
5.			6.			7.			N_4.			8.			9.			10.			11.			12.			13.		
...	211	...	...	198	...	...	123	...	...	54	...	...	168	...	...	247	...	...	177	...	...	156	...	...	255	...	...	225	...

TABLE X.—Arranged Plan of the First Series of Experiments made at Holmston, near Ayr, giving the Produce in Lbs. per Plot or Cwts. per Acre, with the Average of the Two Sections in Tons and Cwts.

	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.
	N.				1.				2.				3.				4.				5.				6.			
Section I.,	109	...	...	...	273	...	...	...	267	...	...	...	174	...	...	...	208	...	...	...	262	...	...	...	183	...	...	...
Section II.,	81	...	...	...	194	...	...	...	227	...	...	...	152	...	...	...	187	...	...	...	211	...	...	...	198	...	...	...
Total, .	190	...	...	...	467	...	...	...	494	...	...	...	326	...	...	...	395	...	...	...	473	...	...	...	381	...	...	...
Average, .	47½	...	...	...	233	...	...	...	247	...	...	...	163	...	...	...	197½	...	...	...	236½	...	...	...	190½	...	...	...
Average per Acre in tons and cwts.,	Bulbs. 2 7½		Leaves.		Bulbs. 11 13½		Leaves.		Bulbs. 12 7		Leaves.		Bulbs. 8 3		Leaves.		Bulbs. 9 17f		Leaves.		Bulbs. 11 16½		Leaves.		Bulbs. 9 10½		Leaves.	

	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.
	7.				8.				9.				10.				11.				12.				13.			
Section I.,	232	...	...	...	180	...	...	...	236	...	...	...	241	...	...	...	183	...	...	...	245	...	...	...	203	...	...	...
Section II.,	123	...	...	...	168	...	...	...	247	...	...	...	177	...	...	...	156	...	...	...	255	...	...	...	225	...	...	...
Total, .	355	...	...	...	348	...	...	...	483	...	...	...	418	...	...	...	339	...	...	...	500	...	...	...	428	...	...	...
Average, .	177½	...	...	...	174	...	...	...	241½	...	...	...	209	...	...	...	169½	...	...	...	250	...	...	...	214	...	...	...
Average per Acre in tons and cwts.,	Bulbs. 8 17½		Leaves.		Bulbs. 8 14		Leaves.		Bulbs. 12 1½		Leaves.		Bulbs. 10 9		Leaves.		Bulbs. 8 9½		Leaves.		Bulbs. 12 10		Leaves.		Bulbs. 10 14		Leaves.	

TABLE XI.—Giving the Results of the First Series of Experiments made at Fairnington.

No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.
N_1.			1.			2.			3.			4.			5.			6.			N_2.			7.			8.		
221	175	22¾	252	286	38	229	266¾	36½	227	289	33½	200	299	40¼	214	235	33	243	250	35½	197	120½	18	221	270	38	233	297	38¾
9.			10.			11.			12.			13.			N_3.			1.			2.			3.			4.		
228	272½	34½	234	275½	33	234	208½	31	212	200	23	205	146	25	210	165	25	243	261	39	257	272½	42	248	279½	39	238	215	26
5.			6.			7.			N_4.			8.			9.			10.			11.			12.			13.		
230	241½	35	236	241½	34	257	264½	33	159	103	22½	246	269	33	231	236	32½	249	327½	44⅓	227	232½	36	242	249½	38	203	136	24

TABLE XII.—Arranged Plan of the First Series of Experiments made at Fairnington, giving the Produce in Lbs. per Plot or Cwts. per Acre, with the Average of the Two Sections in Tons and Cwts.

	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.
	N.				1.				2.				3.				4.				5.				6.			
Section I.,	147¾	20¼	168	13·7	286	38	324	13·2	266½	36½	303	13·6	289	33½	322½	15	299	40¼	339½	13·5	235	33	268	14	250	35½	285½	14·2
Section II.,	134	23¾	157¾	17·7	261	39	300	14·9	272½	42	314½	15·4	279½	39	318½	13·9	215	26	241	12	241½	35	276¼	14·4	241½	34	275½	14
Total, .	281¾	44	325¾	31·4	547	77	624	28·1	539	78½	617½	29	568½	72½	641	28·9	514	66½	580½	25·5	476¾	68	544½	28·4	491½	69½	561	28·2
Average, .	140⅞	22	162⅞	15·7	273¾	38½	312	14·05	269½	39¼	308¾	14·5	284¼	36½	320½	14·4	257	33¼	290¼	12·7	238⅜	34	272¼	14·2	245¾	34¾	280½	14·1
Average per Acre in tons and cwts.,	Bulbs. 7 0		Leaves. 1 2		Bulbs. 13 13		Leaves. 1 18		Bulbs. 13 9		Leaves, 1 19		Bulbs. 14 4		Leaves. 1 16		Bulbs. 12 17		Leaves. 1 13		Bulbs. 11 18		Leaves. 1 14		Bulbs. 12 5		Leaves. 1 14	

	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.
	7.				8.				9.				10.				11.				12.				13.			
Section I.,	270	38	308	14	297	38½	325¼	12·9	272½	34½	307	12·6	275½	33	308½	11·9	208½	31	239½	14·8	200	23	223	11·5	146	25	171	17·1
Section II.,	264¼	33	297½	12·4	269	33	302	15·9	236	32½	268¾	13·7	327½	44½	372	13·5	232½	36	268½	15·4	249½	38	287½	15·2	136	24	160	17·6
Total, .	534¼	71	605½	26·4	566	71½	637½	28·8	508½	67	575¾	26·3	603	77½	680½	25·4	441	67	508	30·2	449½	61	510½	26·7	282	49	331	34·7
Average, .	267⅛	35½	302⅝	13·2	283	35¾	318¾	14·4	254¼	33½	287¾	13·1	301½	38¾	340¼	12·7	220½	33½	254	15·1	224¾	30½	255¼	13·3	141	24½	165½	17·3
Average per Acre in tons and cwts.,	Bulbs. 13 7		Leaves. 1 15		Bulbs. 14 3		Leaves. 1 15		Bulbs. 12 14		Leaves. 1 13		Bulbs. 15 1		Leaves. 1 18		Bulbs. 11 0		Leaves. 1 13		Bulbs. 11 4		Leaves. 1 10		Bulbs. 7 1		Leaves. 1 4	

TABLE XIII.—Giving the Results of the Second Series of Experiments made at Fenton Barns.

No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.
N.			1.			2.			3.			4.			5.			N_2.			7.			8.		
197	204	38	177	271	45	184	264	44	176	300	55	176	200	36	193	214	37	187	223	34	197	204	38	192	256	42	190	261	37
9.			10.			11.			12.			13.			N_3.			1.			2.			3.			4.		
194	306	59	191	230	40	192	224	37	199	244	37	196	205	35	180	185	29	184	195	35	186	288	41	184	277	51	176	202	38
5.			6.			7.			N_4.			8.			9			10.			11.			12.			13.		
196	198	35	186	199	33	189	242	37	179	164	30	177	237	36	190	287	47	182	190	33	178	166	30	186	194	33	196	201	37

TABLE XIV.—Arranged Plan of the Second Series of Experiments made at Fenton Barns, giving the Produce in Lbs. per Plot or Cwts. per Acre, with the Average of the Two Sections in Tons and Cwts.

	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.
	N.				1.				2.				3.				4.				5.				6.			
Section I.,	204	38	242	18·6	271	45	316	16·6	264	44	300	16·6	300	55	355	18·8	200	36	236	18·0	214	37	251	17·2	223	34	257	15·2
Section II.,	185	29	214	15·6	195	35	230	17·9	288	41	329	14·2	277	51	328	18·4	202	38	240	18·8	198	35	233	17·6	199	33	232	16·5
Total, .	389	67	456	34·2	466	80	546	34·5	552	85	629	30·8	577	106	683	36·7	402	74	476	36·8	412	72	484	34·8	422	67	489	31·7
Average, .	194½	33½	228	17·1	233	40	273	17·2½	276	42½	314½	15·4	288½	53	341½	18·3½	201	37	238	18·4	206	36	242	17·4	211	33½	244½	15·8½
Average per Acre in tons and cwts.,	Bulbs. 9 14½		Leaves. 1 13½		Bulbs. 11 13		Leaves. 2 0		Bulbs. 13 16		Leaves. 2 2½		Bulbs. 14 8½		Leaves. 2 13		Bulbs. 10 1		Leaves. 1 17		Bulbs. 10 6		Leaves. 1 16		Bulbs. 10 11		Leaves. 1 13½	
	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.
	7.				8.				9.				10.				11.				12.				13.			
Section I.,	256	42	298	16·4	261	37	298	14·1	306	59	365	19·2	230	40	270	17·3	224	37	261	16·5	244	37	281	15·1	205	35	240	17·0
Section II.,	242	37	279	15·2	237	36	273	15·1	287	47	334	16·3	190	33	223	17·3	166	30	196	18·0	194	33	227	17·0	201	37	238	18·4
Total, .	498	79	577	31·6	498	73	571	29·2	593	106	699	35·5	420	73	493	34·6	390	67	457	34·5	438	70	508	32·1	406	72	478	35·4
Average, .	249	39½	288½	15·8	249	36½	285½	14·6	296½	53	349½	17·7½	210	36½	246½	17·3	195	33½	228½	17·2½	219	35	254	16·0½	203	36	239	17·7
Average per Acre in tons and cwts.,	Bulbs. 12 9		Leaves. 1 19½		Bulbs. 12 9		Leaves. 1 16½		Bulbs. 14 16½		Leaves. 2 13		Bulbs. 10 10		Leaves. 1 16½		Bulbs. 9 15		Leaves. 1 13½		Bulbs. 10 19		Leaves. 1 15		Bulbs. 10 3		Leaves. 1 16	

TABLE XV.—Giving the Results of the Second Series of Experiments made at Snawdon, Gifford.

No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.
N_1.			1.			2.			3.			4.			5.			6.			N_2.			7.			8.		
239	180	60	239	272	101	215	350	125	216	373	151	215	262	103	220	269	81	212	293	96	...	...	...	218	325	97	229	389	84
9.			10.			11.			12.			13.			N_3.			1.			2.			3.			4.		
231	310	98	243	296	93	224	264	91	230	283	94	232	322	108	...	...	...	223	290	93	228	315	97	241	349	117	228	294	92
5.			6.			7.			N_4.			8.			9.			10.			11.			12.			13.		
252	311	93	231	313	114	229	318	107	219	200	73	205	412	143	210	427	165	210	321	107	241	279	96	221	336	105	228	332	106

TABLE XVI.—Arranged Plan of the Second Series of Experiments made at Snawdon, Gifford, giving the Produce in Lbs. per Plot or Cwts. per Acre, with the Average of the Two Sections in Tons and Cwts.

	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.
	N.				1.				2.				3.				4.				5.				6.			
Section I.,	180	60	240	30·3	272	101	373	30·6	350	125	475	35·7	378	151	524	40·4	262	103	365	39·6	269	81	350	33·9	293	96	389	32·9
Section II.,	200	73	273	36·5	290	93	383	32	315	97	412	30·7	349	117	466	33·4	294	92	386	31·2	311	93	404	29·9	313	114	427	36·4
Total, .	380	133	513	66·8	562	194	756	62·6	665	222	887	66·4	722	268	990	73·8	556	195	751	70·8	580	174	754	63·8	606	210	816	69·3
Average, .	190	66·5	256·5	33·4	281	97	378	31·3	332·5	111	443·5	33·2	361	134	495	36·9	278	97·5	375·5	35·4	290	87	377	31·9	303	105	408	34·6
Average per Acre in tons and cwts.,	Bulbs. 9 5		Leaves. 3 6·5		Bulbs. 14 1		Leaves. 4 17		Bulbs. 16 12·5		Leaves. 5 11		Bulbs. 18 1		Leaves. 6 14		Bulbs. 13 18		Leaves. 4 17·5		Bulbs. 14 10		Leaves. 4 7		Bulbs. 15 3		Leaves. 5 5	

	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.
	7.				8.				9.				10.				11.				12.				13.			
Section I.,	325	97	422	29·5	389	84	473	21·5	310	98	408	31·6	296	93	389	31·4	264	91	355	34·4	283	94	377	33·2	322	108	430	33·5
Section II.,	318	107	425	33·6	412	143	555	34·7	427	165	592	38·6	321	107	428	33·3	279	96	375	34·4	336	105	441	31·2	332	106	438	31·9
Total, .	643	204	847	63·1	801	227	1028	56·2	737	263	1000	70·2	617	200	817	64·7	543	187	730	68·8	619	199	818	64·4	654	214	868	68·4
Average, .	321·5	102	423·5	31·5	400	113·5	514	28·1	368·5	131·5	500	35·1	308·5	100	408·5	32·3	271·5	98·5	365	34·4	309·5	995	409	32·2	327	107	434	34·2
Average per Acre in tons and cwts.,	Bulbs. 16 1·5		Leaves. 51 0		Bulbs. 20 0		Leaves. 5 13·5		Bulbs. 18 8·5		Leaves. 6 11·5		Bulbs. 15 8·5		Leaves. 5 0		Bulbs. 13 11·5		Leaves. 4 18·5		Bulbs. 15 9·5		Leaves. 49 15		Bulbs. 16 7		Leaves. 5 7	

TABLE XVII.—Giving the Results of the Second Series of Experiments made at Leuchland, Forfarshire.

No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.
N_1.			1.			2.			3.			4.			5.			6.			N_2.			7.			8.		
141	57	13	186	288	86	160	222	67	172	256	76	173	223	59	193	270	45	177	285	64	89	9	5	188	315	65	196	341	70
9.			10.			11.			12.			13.			N_3.			1.			2.			3.			4.		
180	305	87	162	228	54	175	225	50	164	222	49	62	10	3	76	12	5	161	249	66	174	252	60	160	247	62	179	231	43
5.			6.			7.			N_4.			8.			9.			10.			11.			12.			13.		
170	196	31	194	300	66	200	360	71	109	26	10	205	399	83	216	366	104	175	226	44	174	242	47	175	233	45	64	7	3

TABLE XVIII.—Arranged Plan of the Second Series of Experiments made at Leuchland, giving the Produce in Lbs. per Plot or Cwts. per Acre, with the Average of the Two Sections in Tons and Cwts.

	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.
	N.				1.				2.				3.				4.				5.				6.			
Section I.,	33	9	42	...	288	86	374	...	222	67	289	...	256	76	332	...	223	59	282	...	270	45	315	...	285	64	349	...
Section II.,	19	7½	26½	...	249	66	315	...	252	60	312	...	247	62	309	...	231	43	274	...	196	31	227	...	300	66	366	...
Total, .	52	16½	68½	...	537	152	689	...	474	127	601	...	503	138	641	...	454	102	556	...	466	76	542	...	585	130	715	...
Average, .	26	8¼	34¼	31·7	268½	76	344½	28·3	237	63½	300½	26·8	251½	69	320½	27·5	227	51	278	22·4	233	38	271	16·3	292½	65	357½	22·2
Average per Acre in tons and cwts.,	Bulbs. 1 6		Leaves. 0 8¼		Bulbs. 13 8½		Leaves. 3 16		Bulbs. 11 17		Leaves. 3 3¾		Bulbs. 12 11½		Leaves. 3 9		Bulbs. 11 7		Leaves. 2 11		Bulbs. 11 13		Leaves. 1 18		Bulbs. 14 12½		Leaves. 3 5	

	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.
	7.				8.				9.				10.				11.				12.				13.			
Section I.,	315	65	380	...	341	70	411	...	305	87	392	...	228	54	282	...	225	50	275	...	222	49	271	...	10	3	13	...
Section II.,	360	71	431	...	399	83	482	...	366	104	470	...	226	44	270	...	242	47	289	...	233	45	278	...	7	3	10	...
Total, .	675	136	811	...	740	153	893	...	671	191	862	...	454	98	552	...	467	97	564	...	455	94	549	...	17	6	23	...
Average, .	337½	68	405½	20·1	370	76½	446½	20·7	335½	95½	431	28·3	227	49	276	21·6	233½	48½	282	20·6	227½	47	274½	20·7	8½	3	11½	35·3
Average per Acre in tons and cwts.,	Bulbs. 16 17½		Leaves. 3 8		Bulbs. 18 10		Leaves. 3 16½		Bulbs. 16 15½		Leaves. 4 15½		Bulbs. 11 7		Leaves. 2 9		Bulbs. 11 13½		Leaves. 2 8½		Bulbs. 11 7½		Leaves. 2 7		Bulbs. 0 8½		Leaves. 0 3	

TABLE XIX.—Giving the Results of the Second Series of Experiments made at Littleton.

No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.
N_1.			1.			2.			3.			4.			5.			6.			N_2.			7.			8.		
196	227	62	214	259	100	222	270	101	208	256	111	212	262	102	206	270	76	218	298	91	184	101	32	208	360	109	216	324	106
9.			10.			11.			12.			13.			N_3.			1.			2.			3.			4.		
204	258	102	216	305	105	212	279	75	212	280	86	148	72	24	200	168	57	224	289	106	220	317	103	212	268	87	226	256	87
5.			6.			7.			N_4.			8.			9.			10.			11.			12.			13.		
212	309	106	230	336	113	204	313	81	170	182	70	216	336	116	214	289	107	228	322	102	222	249	74	222	274	83	202	280	40

TABLE XX.—Arranged Plan of the Second Series of Experiments made at Littleton, giving the Produce in Lbs. per Plot or Cwts. per Acre, with the Average of the Two Sections in Tons and Cwts.

	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.
	N.				1.				2.				3.				4.				5.				6.			
Section I.,	164	47	211	28·6	259	100	359	38·6	270	101	371	37·4	256	111	367	43·3	262	102	364	38·9	270	76	346	28·1	298	91	389	30·5
Section II.,	175	63·5	238·5	36·2	289	106	395	36·6	317	103	420	32·4	268	87	355	32·4	256	87	343	34	309	106	415	34·3	336	113	449	33·6
Total, .	339	110·5	449·5	...	548	206	754	...	587	204	791	...	524	198	722	...	518	189	707	...	579	182	761	...	634	204	838	...
Average, .	169·5	55·2	224·7	32·4	274	103	377	37·6	293·5	102	395·5	34·9	262	99	361	37·8	259	94·5	353·5	36·4	289·5	91	380·5	31·2	317	102	419	32·1
Average per Acre in tons and cwts.,	Bulbs. 8 9		Leaves. 2 15		Bulbs. 13 14		Leaves. 5 3		Bulbs. 14 13		Leaves. 5 2		Bulbs. 13 2		Leaves. 4 19		Bulbs. 12 19		Leaves. 4 14		Bulbs. 14 9		Leaves. 4 11		Bulbs. 15 17		Leaves. 5 2	

	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.
	7.				8.				9.				10.				11.				12.				13.			
Section I.,	360	109	469	30·2	324	106	430	32·7	258	102	360	39·5	305	105	410	34·7	279	75	354	26·8	280	86	366	30·7	72	24	96	33·3
Section II.,	313	81	394	25·8	336	116	452	34·5	289	107	396	37	322	102	424	31·7	249	74	323	29·7	274	83	357	30·3	280	40	320	14·3
Total, .	673	190	863	...	660	222	882	...	547	209	756	...	627	207	834	...	528	149	677	...	554	169	723	...	352	64	416	...
Average, .	361·5	95	431·5	28	330	111	441	33·6	273·5	104·5	378	38·2	313·5	103·5	417	33·2	264	74·5	338·5	28·2	277	84·5	361·5	30·5	176	32	208	23·8
Average per Acre in tons and cwts.,	Bulbs. 16 16		Leaves. 4 15		Bulbs. 16 10		Leaves. 5 11		Bulbs. 13 13		Leaves. 5 4		Bulbs. 15 13		Leaves. 5 3		Bulbs. 13 4		Leaves. 3 14		Bulbs. 13 17		Leaves. 4 4		Bulbs. 8 16		Leaves. 1 2	

TABLE XXI.—Giving the Results of the Second Series of Experiments made at Greenan, 1867.

No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.	No. of Bulbs.	Weight of Bulbs.	Weight of Leaves.
N_1.			1.			2.			3.			4.			5.			6.			N_2.			7.			8.		
209	304	78	218	384	85	212	387	84	220	419	94	219	378	86	220	339	85	214	321	74	...	...	...	195	363	77	185	339	67
9.			10.			11.			12.			13.			N_3.			1.			2.			3.			4.		
211	366	99	216	325	71	217	312	59	199	295	76	215	304	67	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5.			6.			7.			N_4.			8.			9.			10.			11.			12.			13.		
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

TABLE XXII.—Arranged Plan of the Second Series of Experiments made at Greenan, 1867, giving the Produce in Lbs. per Plot or Cwts. per Acre, with the Average of the Two Sections in Tons and Cwts.

	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.
	N.				1.				2.				3.				4.				5.				6.			
Section I.,	304	78	382	25·6	384	85	469	22·1	387	84	471	21·7	419	94	513	22·4	378	86	464	22·7	339	85	424	25·0	321	74	395	23·0
Section II.,	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Total, .	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Average, .	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Average per Acre in tons and cwts.,	Bulbs.		Leaves.		Bulbs.		Leaves.		Bulbs.		Leaves.		Bulbs.		Leaves.		Bulbs.		Leaves.		Bulbs.		Leaves.		Bulbs.		Leaves.	
	15 4		3 18		19 4		4 5		19 7		4 4		20 19		4 14		18 18		4 6		16 19		4 5		16 1		3 14	

	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.	Bulbs.	Leaves.	Gross.	Leaves p. cent.
	7.				8.				9.				10.				11.				12.				13.			
Section I.,	363	77	440	21·2	339	67	406	19·7	366	99	465	27·0	325	71	396	21·8	312	59	371	18·9	295	76	371	25·7	304	67	371	22·0
Section II.,	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Total, .	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Average, .	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Average per Acre in tons and cwts.,	Bulbs.		Leaves.		Bulbs.		Leaves.		Bulbs.		Leaves.		Bulbs.		Leaves.		Bulbs.		Leaves.		Bulbs.		Leaves.		Bulbs.		Leaves.	
	18 3		3 17		16 19		3 7		18 6		4 19		16 5		3 11		15 12		2 19		14 15		3 16		15 4		3 7	

APPENDIX (A).

PROCEEDINGS

OF

THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND.

PRELIMINARY NOTICE.

THE Directors having resolved to publish in the Transactions the Proceedings at the half yearly General Meetings of the Society, as well as an abstract of the business at the Board Meetings, the usual Preliminary Notice to each volume will in future be superseded.

They, however, consider it their duty specially to record that, since the date of the last notice, the Society has had to regret the death of two distinguished Members, Mr Macduff of Bonhard, who died while holding the office of Secretary, and Mr Hall Maxwell of Dargavel, C.B., who held the same post for upwards of twenty years. The sense of the great loss the Society sustained by the death of these gentlemen has found expression in the Resolutions adopted at the General Meetings in June 1866, and January 1867.

The Directors must further take this opportunity of recording their opinion that the Society has been exceedingly fortunate in the choice of its present Secretary, Mr Fletcher Norton Menzies. The ability he has already shown—particularly the manner in which he conducted the last General Show at Glasgow, satisfactory alike to the Society and the public—affords the best earnest that while he holds office the business will continue to be performed in a way worthy of the important place which the Society has long held in the estimation of the public.

PROCEEDINGS AT GENERAL MEETINGS.

GENERAL MEETING, 6th JUNE 1866.

LORD BELHAVEN and STENTON, K.T., Vice-President, in the Chair.

A letter was read from the Duke of Buccleuch, President of the Society, regretting that it would not be in his power to attend the meeting, owing to his absence in London.

THE SECRETARYSHIP.

Mr CAMPBELL SWINTON, yr. of Kimmerghame, said he had been requested by the Directors to state the steps they had found it necessary to take in consequence of the melancholy event by which, as they were aware, they had been deprived of the services of the gentleman whom they had hoped to see occupying the position of Secretary of the Society. They all knew how gratifying it was to Mr Macduff to have that appointment conferred upon him, and the Directors of the Society had been looking confidently forward to having the benefit of his services. They were all aware that, shortly after his appointment, he had been seized with severe illness, which at length terminated fatally. He was sure he only expressed the feelings of the Society generally, as well as of the Directors, when he said how much they were indebted to Mr Hall Maxwell for the kind and considerate manner in which, during Mr Macduff's somewhat lengthened illness, he had continued to perform the duties of Secretary in Mr Macduff's behalf. The Directors had recorded, what he was sure the members of the Society would concur in, their thanks to Mr Maxwell, which were likewise deeply felt by Mr Macduff and his family, for his kindness. He was sure they would also concur in the feeling of the Directors that it would be wrong in them, in reporting the proceedings taken in regard to the filling up of the vacancy, were they not to place on record the loss the Society had sustained by the death of the late Secretary. With that view he would propose they should adopt a minute to this effect:—"The Directors cannot report to the Society the steps which it has been necessary for them to take for filling up the office of Secretary without desiring to record their sense of the great loss the Society has sustained by the death of Mr Macduff of Bonhard, who was so recently appointed to that office. Mr Macduff had been for several years an Ordinary Director of the Society, and all interested in its proceedings are aware of the zeal, ability, and discretion which he brought to the conduct of its affairs, and will participate in the deep regret which his premature death has occasioned to a wide circle of friends and acquaintances." Having read the minute, it only remained for him to report to them that the Directors proceeded to fill up in a temporary way the office of Secretary. They could not ask the formal approval of the Society at this meeting, because, by the terms of the charter, that approval could only be given at the January meeting; but he could not doubt that the steps taken by the Directors would, at the January meeting, receive their approval. It was for him to report simply for the information of the meeting that the

Directors had unanimously appointed as Secretary Mr Fletcher Norton Menzies, a gentleman who, besides the knowledge the Directors had of his qualifications for the office, had this recommendation, that on the occasion of Mr Macduff's election, Mr Menzies stood second on the list of candidates, and received on that occasion very influential and important support. The Directors confidently recommend him to the Society as one who could most efficiently and ably discharge the duties of the office.

New Members.

The Secretary (Mr Menzies) said they had an unusually small number of new members to present on this occasion, arising from the fact that there would be no show this year. Seven gentlemen were then balloted for and admitted.

Transactions of the Society.

Mr Irvine of Drum reported that, in accordance with the intimations made by him at former general meetings, the Transactions of the Society had now been published separately from the *Journal of Agriculture*, and are sent to members without charge. He had now the pleasure of laying the new number on the table. As the number was the first of a new series—the fourth—the Directors had in the preliminary notice briefly referred to the origin of the Transactions, and to the periods at which the various series had appeared. (See notice prefixed to the first volume.) The Directors had resolved that a general index to the last or third series of the Transactions should be immediately commenced, with the view of afterwards extending it to the second and first. This was now engaging the attention of the Secretary, and the index would in due time be published. The papers for the next number were now under consideration, and the Directors hoped it would appear about the end of February. As members were aware, two numbers, or the Transactions for two years, formed one volume. In connection with this subject, he might also report that the gold medal for a report of experiments on rye grass and clover with different top-dressings, and the silver medal for a report of experiments on turnips, had been awarded. Both prizes had been gained by the same gentleman—Mr Russell Swanwick, Whittington, Chesterfield, who, though dating from the Royal Agricultural College, Gloucestershire, was a member of the Highland Society, and conducted his experiments on the farm of Fenton Barns, East Lothian.

Mr Harvey, Whittingham Mains, said that a few years ago he got placed on the premium list, to be competed for in 1864–65, comparative experiments with four different kinds of wheat. He was appointed one of the judges, and convener of them. The premiums were competed for by two gentlemen in East Lothian and one in Ayrshire, and he had gone down to Ayrshire two different years to report. He found that no notice had yet been taken in the Transactions of these experiments, although they had all been reported on before Martinmas last; and not being published in the Transactions now, they would not appear till 1867. He did not think that was very business-like. However, he believed the forms of the Society, and the general way of conducting these things, had led to it. He found no fault with the late Secretary or the officials, but surely if the thing was to be of any use, and after an expenditure of L.50 on it, the world ought to know the result. He proposed that the manuscripts should be sent to the agricultural papers, leaving the authorised reports to be published in the Transactions when convenient. He had had complaints from the competitors that the publication had taken so long a time, and he had also been spoken to by several other gentlemen about it.

Mr Irvine said one reason why these reports had not appeared so soon as might be desirable, was the limited space at their disposal in the Transactions

but he had obtained the sanction of the Directors to an enlargement, so that he would be enabled to publish papers more rapidly than had hitherto been done. He might mention that the papers referred to would form part of the forthcoming number. The subject had engaged the attention of the Directors, and they had authorised the Committee on Publications to communicate to the agricultural newspapers such matters as might be of importance and interest, but which could not appear in the Transactions for some time.

Postponement of General and District Shows.

Mr Kinloch, yr. of Gilmerton reported, that owing to the prevalence of cattle plague, the shows, which were arranged to be held at Glasgow in the summer of 1866, and at Aberdeen in the summer of 1867, had been respectively postponed for one year.

Mr Campbell Swinton made a similar anouncement with regard to the district shows.

Agricultural Education.

Mr Walker of Bowland, reported that the examinations took place on the 7th of March last, when two students were found entitled to the Society's Agricultural Certificate and Diploma—viz., R. H. Goddard, Newcastle-on-Tyne; and G. Y. Wall, jun., Durham—both educated at the Royal Agricultural College, Cirencester. The two prizes annually allowed to the students who pass the best and second best examinations in the agricultural class in the University of Edinburgh, were this year awarded by Professor Wilson to—1st, Francis Moffat Haldane, Edinburgh; 2d, David Carswell, Rathillet, Fifeshire.

Chemical Department.

Professor Anderson gave in the report on the chemical department. During the past six months the amount of work gone through in the laboratory was very large. The number of analyses made for the members of the Society exceeded the number in preceding years, and had involved many matters not only of individual interest, but of importance to the community at large. He had particularly directed his attention at this time to the adulteration of oilcake—a subject of such importance that he thought it necessary to publish a short paper in the last issue of the Transactions. Since that time he had prosecuted inquiries as far as possible, and had discovered some cases of adulteration. He had seen several samples of linseed sold to manufacturers which really contained only a small per cent. of that substance, the remainder being seeds of grasses and weeds. He had no doubt that was carried on to a considerable extent. He had observed some curious points connected with the supply of Peruvian guano this year. It was generally under the average. Several cargoes contained masses of saline matter, and small stones and sand to the extent of five, ten, and even more per cent.—a very unusual occurrence. Several cases of very flagrant adulteration had also occurred. During the past few months, he had also been occupied in arranging the details of the system of field experiments now determined on by the Society. He had had to organise the whole system on which these experiments were to proceed, which involved a large amount of correspondence, and a great deal of miscellaneous work. The whole manures were weighed by himself and his coadjutors, and it would give an idea of the amount of work when he stated that upwards of one thousand parcels of manure of different kinds had been thus weighed out. All this had been done with great care, so as to secure the most perfect uniformity in the experiments. The experimenters had had special instructions given them, so that the thing might be done in a satisfactory manner. Through the instrumentality of the local committees, a body of experimenters had been selected, men of the very

highest standing. He had no doubt the results would form a most important contribution to the exact knowledge of the science of agriculture.

Veterinary College.

Sir A. C. Ramsay Gibson-Maitland reported that the Society's Veterinary Diploma had been conferred on the following students:—J. W. Wright, Belbrough, Yorkshire; James M. Eckford, Leith; Alex. Stewart, Rothiemay, Aberdeen; W. S. Whitney, Cork; Albert S. Cox, Manchester; John Simon, Auchterless, Aberdeen; Alex. E. Macgillivray, Rayne, Aberdeen; William Summers, Chardslock, Dorset; James Scrymgeour, St John's, New Brunswick; William Fearnley, Featherstone, York; Edward Lewis, Great Budworth, Cheshire; J. H. Hughes, Swansea; Robert Bulman, Hexham; William Dacre, Manchester; W. Waterhouse, Brierly Manor, Barnsley; W. Little, Northcave, Yorkshire; Robert Meiklam, East Kilpatrick; James M'Connell, Wigtown; Archibald Donald, Paisley; Peter Turnbull, Rhynie, Aberdeen; James P. S. Walker, Evanton, Ross-shire; John Burnett, Dundonald, Ayrshire; Joseph Kendall, Lowick Bridge, Lancashire; David G. Duns, Dunse; Maurice O'Brien, Clonmel; James Kettle, Leith Fort. He said: I have to report that the usual examinations took place about the middle of April, and were carried on and completed with the usual success which has for many years attended them; and I would express the regret of those persons who were there that the attendance of visitors at these very interesting examinations was so very small. I very much regret to say that my brother lairds almost never attend; and the examinations are left to be supported by the more influential tenant-farmers in the district. Now, I regret the absence of the landlords, many of whom take great interest in our domestic animals generally; and I feel certain, if they only knew how great the encouragement of their presence is both to teachers and taught, they would even put themselves to a little trouble to attend; and when we consider that the examining tables are presided over by some of the ablest men in Edinburgh, I can assure them they can scarcely be there without carrying away with them much useful information. The examinations this year had, I may say, a melancholy interest. The moving spirit in that class-room had passed for ever from among his pupils and friends. I feel quite certain that I express the feeling of every member of this great Society when I say, that every one regretted the loss which the Highland Society of Scotland has sustained by the death of Professor Dick; and when I say, further, that Professor Dick was the first educated person in Scotland who made an attempt to rescue the veterinary science from obscurity, I am quite sure we may take the whole public with us as sharers of that regret. There was so good an article tracing the career and life of the late Professor published in the *North British Agriculturist* within a few days after his death, that I am not going to take up your time by following out his interesting career. But I may very shortly state, as some of you may not have read that article, that in 1818 Professor Dick first opened a class-room in Edinburgh in a small and modest shop in Niddry Street, and so little success had he the first year, that I am credibly informed he had but one pupil. However, those who know the character of the good Professor are well aware that he was not the man to be easily set aside from the path on which he had entered. We find him, accordingly, moving from Niddry Street to Nicolson Street, and from thence to the Calton Convening Rooms; and again from these rooms in 1833 to that class-room in Clyde Street where he taught for so many years ably and efficiently. Perhaps the best proof of the esteem in which the Professor was held in Edinburgh was this fact, that year after year the examiners who attended to examine his students were among the first men in Edinburgh. I am quite sure this Society will most unanimously put on their minutes their regret at the loss sustained by the death of Professor Dick. In connection with the subject of

the Veterinary College, I wish to bring before you the fact, which most of you are already aware of, that there is a bill passing through the House of Commons brought in by Mr Holland. The Directors propose that this meeting should petition against that bill, and also that you should appoint a committee to watch over the progress of the bill, and likewise that you should remit to the Directors to consider the subject of a charter for a Veterinary College.

Mr Hope, Fenton Barns, said that the Directors met recently to consider Mr Holland's bill, but they were then led to believe that it had been withdrawn for the session. They had just learned to-day, however, that the bill was to go on. It appeared to him that by that bill no one holding the certificate of the Highland Society only, would be entitled to call himself a veterinary surgeon, that being reserved exclusively for members of the Royal Veterinary College. He did not think it would be doing justice to those veterinary surgeons who simply held the Highland Society's certificate if the bill were allowed to pass, and he hoped the meeting would agree at once to petition Parliament against the bill. The same committee named by this meeting would also take into consideration the proposal of having a charter for Scotland. He might mention that steps were now being taken to obtain a charter, and that it would be opposed by the members of the Royal College of London, who wished to retain that right exclusively. For himself he did not see why they should not have a chartered Veterinary College in Edinburgh as they had Colleges of Physicians and Surgeons, and that the Scottish metroplis should stand in the same position as London in this matter. The death of Professor Dick, and the handing over of his college to this city, seemed to him to make the present time opportune for asking such a charter, and it would be for the interest of veterinary science that it was obtained at once.

Mr Wardlaw Ramsay of Whitehill thought there could be no difficulty in agreeing to petition against a bill of this sort, which struck at the very root of the Highland Society's operations in this matter. He cordially seconded the motion to petition against the bill.

After some discussion on the subject, the meeting resolved to express the sense which the Society entertained of the loss they had suffered by the death of Professor Dick. It was also agreed to remit to the Directors to consider the subject of a charter for a veterinary college for Scotland; likewise to petition against Mr Holland's bill, the petition to be signed by Lord Belhaven in name of the meeting. It was further resolved immediately to telegraph the resolution of the Society on the subject of Mr Holland's bill to the Duke of Buccleuch, Sir William Stirling-Maxwell, and Mr Duncan M'Laren.

Sir Alexander C. R. Gibson-Maitland, Bart.; Dr Burt, Mr C. Swinton, yr. of Kimmerghame; Mr Hope, Fenton Barns; Mr Goodlet, Bolshan; Mr Gillon of Wallhouse; Mr Kinloch, yr. of Gilmerton; and Mr Sadler, Ferrygate, were appointed to draw up the petition.

Cultivation by Steam.

The Marquis of Tweeddale, who was received with applause, reported that on the 7th of February last the Directors appointed a committee to report on the various systems of cultivating by steam, consisting of himself as chairman; Professor Macquorn Rankine, Consulting Engineer to the Society; Mr Gibson, Wolmet, Chairman of the Machinery Committee; Mr Slight, Curator of Machinery; Sir Thomas Buchan Hepburn, Bart.; Mr Henry Stephens; Mr Gray, Southfield; Mr Milne, Niddrie Mains. On the 19th and 20th March, the committee inspected the machines in operation on the following farms in East Lothian:—Ferrygate (Mr Sadler's), Fowler's single engine; Castle Mains (Mr Todd's), do.; Queenston Bank (Mr Begbie's); Fenton Barns (Mr Hope's), Howard's; Drem (Mr Reid's), Coleman's. And on the 4th of May the committee inspected Fowler's double engine at work on Mr Henderson's farm of Markle in the same county. A set of queries to be answered by the manu-

facturer and the farmer had been issued to 438 parties now using steam-ploughs or cultivators in England, Scotland, and Ireland. Many of the farmers had already given most elaborate answers, though the return of the schedules is not due till the 2d of July. The noble Marquis mentioned that it was the intention of the Directors to extend the period of observation in steam cultivation to the whole year, in order that they might have an opportunity of examining the different modes of stirring the soil, as well as the instruments that had been brought into use, and had been employed since steam had been brought so much into use in agriculture. It would be one of the great objects of this committee to inform those that wished to engage in steam cultivation of all that was necessary to be known in regard to it. They would have an opportunity of knowing the expense of the engines, of the apparatus, the cost of tear and wear, and the number of men required to work the engines, and all the contingent expenses; as also the amount of labour that could be performed within a specified time. In short, the committee hoped to be able to answer the whole inquiries of those who contemplated the introduction of steam cultivation on their farms.

The report was unanimously approved.

The Society's Premises.

Mr Murray of Dollerie, in the absence of Mr Mackenzie of Dolphinton, reported that, in conformity with the authority given at the general meeting on the 17th of January last, the collection of roots, seeds, woods, and other articles of produce in the Society's Museum had been entirely made over to and accepted by Government for the Museum of Science and Art in Edinburgh. This had enabled the Directors to effect a very convenient arrangement for conducting the Society's business. The Albyn Place property had been disposed of, the first floor of the museum had been converted into offices, including a board-room, and the whole business of the Society would, in future, be concentrated in George IV. Bridge. The price of the Albyn Place house had been invested in railway debentures.

The report was approved.

Removal of Sheep.

Mr Goodlet, Bolshan, wished to draw the attention of the meeting to the restrictions on the removal of sheep under the late Privy Council Orders. By the 47th section, no sheep could be removed from one place to another in any county or district within ten miles of any infected place; and the consequence was that, there being infection in several parts of the county of Forfar, the sheep there could not be removed at all. The restriction caused a great amount of what he thought unnecessary hardship in the county, and he, for example, had grass parks a mile or two from his farm, to which he could not remove his sheep without breaking the law, although there was no infection in the locality, and the local authority could not, under the Order in Council, give him the requisite authority. The restrictions on the movement of sheep were, strange to say, much greater than on the movement of cattle, though it was among the cattle that the great pestilence had broken out; and it was a very doubtful matter whether the disease had ever attacked the sheep at all. He moved that the Society petition to get that part of the clause containing this restriction struck out of the Privy Council Order, leaving the matter to rest on the 49th clause.

Mr Russell, Pilmuir; Mr Harvey, Whittingham Mains; Mr Campbell Swinton, and others, having expressed their opinion on the subject,

Mr Walker of Bowland seconded Mr Goodlet's motion, which he thought was founded on reason and experience. The 49th clause, he thought, afforded all the protection in regard to the movement of sheep that could be desired or required. He did not, however, think that all restrictions should be done away. Knowing, as they did, the extent of the calamity in Forfarshire, and still

more in Cheshire, he thought they must make up their minds to a good deal of inconvenience in regard to the removal of animals, for the purpose of avoiding, if possible, the still further ravages of this dreadful disease. But he thought the 49th section gave sufficient powers to the local authority, while the 47th contained restrictions which were greater than those in the case of cattle.

The SECRETARY pointed out that by No. 7 of the bye-laws this petition could not be moved without a week's previous notice having been given to the Directors; but the meeting might remit it to the Directors in terms of Mr Goodlet's motion.

Mr GOODLET said that would be perfectly satisfactory. And it was resolved to request the Directors to petition for the proposed modification of the 47th clause.

On the motion of Sir A. C. R. GIBSON-MAITLAND a vote of thanks was given to Lord Belhaven for presiding.

GENERAL MEETING, 16TH JANUARY 1867.

His Grace the DUKE of BUCCLEUCH and QUEENSBERRY, K.G., President of the Society, in the Chair.

DIRECTORS AND OFFICE-BEARERS FOR 1867.

The following noblemen and gentlemen were elected directors and office-bearers for the ensuing year:—

President.—His Grace the Duke of Buccleuch and Queensberry, K.G.

Vice-Presidents.—The Earl of Glasgow; Lord Belhaven, K.T.; the Earl of Dalhousie, K.T.; Lord Blantyre.

Extraordinary Directors.—William Fraser Tytler of Aldourie; the Hon. the Lord Provost of Glasgow; Sir Edward Colebrooke, Bart., M.P.; Patrick Boyle of Shewalton; John Malcolm of Poltalloch; Sir Michael R. Shaw Stewart, Bart.; Sir William Stirling Maxwell, Bart., M.P.; Sir James Fergusson, Bart., M.P.; Sir Walter Elliot of Wolfelee, K.S.I.; Archibald A. Speirs of Elderslie, M.P.

Ordinary Directors.—Patrick Dudgeon of Cargen; Andrew Gillon of Wallhouse; William Gray, Southfield; J. G. Heddle of Melsetter; Robert Pillans Newton of Castlandhill; William Sadler, Ferrygate; James Wilson, Wester Cowden; Sir Alexander C. R. Gibson-Maitland, Bart.; George Robertson Barclay of Keavil; John Dudgeon, Almondhill; Robert Dundas of Arniston; William Goodlet, Bolshan; James Roberton, Ladyrig; John Stirling of Kippendavie; Archibald Campbell Swinton, yr. of Kimmerghame; William Stuart Walker of Bowland; Sir Thomas Buchan Hepburn, Bart.; William Wallace Hozier, yr. of Mauldslie; William Mure of Caldwell; Thomas Park, Stoneyhill; Walter Reid, Drem; Graham Somervell of Sorn; Graham Binny, W.S., Edinburgh; Colonel Archibald Campbell, yr. of Blythswood; Colonel Joseph Dundas of Carron Hall; Robert Elliot, Laighwood; James Geddes, Orbliston; John Ord of Muirhouselaw; Major John Ramsay of Barra; Robert Russell, Pilmuir.

Office-Bearers.—The Right Hon. Sir George Clerk of Penicuik, Bart., Hon. Secretary; the Right Hon. Sir William Gibson-Craig of Riccarton, Bart., Treasurer; Fletcher Norton Menzies, Secretary; Rev. James Grant, D.C.L., D.D., Chaplain; Thomas Anderson, M.D., Professor of Chemistry in the University of Glasgow, Chemist; Kenneth Mackenzie, C.A., Auditor; M. J. Macquorn Rankine, LL.D., Professor of Civil Engineering in the University of Glasgow, Consulting Engineer; Gourlay Steell, R.S.A., Animal Portrait Painter; J. H. B. Hallen, Professor of Veterinary Surgery; Thomas Duncan, Clerk; Arthur King and Co., Aberdeen, Publishers of "Transactions;" Neill

and Co., Printers; Mackay, Cunningham, and Co., Silversmiths; Alexander Kirkwood, Medalist; Alexander Slight, Curator of Implements and Machines; John Watherston & Sons, Inspectors of Works; William M'Neill, Messenger.

Chairmen of Standing Committees.—Argyll Naval Fund—Admiral Sir William J. Hope Johnstone, K.C.B., *Chemistry*—Professor Anderson. *Cottages*—Harry Maxwell Inglis of Logan Bank. *District Shows*—A. Campbell Swinton, yr. of Kimmerghame. *Finance*—Anthony Murray of Dollerie. *General Shows*—Alexander Kinloch, yr. of Gilmerton. *House and Buildings*—John Ord Mackenzie of Dolphinton. *Machinery*—John Gibson, Woolmet. *Premiums for Reports on the Science and Practice of Agriculture*—Professor Lyon Playfair, C.B. *Premiums for Reports on Woods and Plantations*—Professor Balfour. *Publications*—Alexander Forbes Irvine of Drum. *Veterinary College Examinations*—Professor Goodsir.

Council on Education.

By a Supplementary Charter under the Great Seal, granted in 1856, the Society is empowered to prescribe a curriculum for agricultural education, and to grant diplomas.

Members of Council named by Charter.—The Duke of Buccleuch, President; the Lord Justice-General, Vice-President; the Lord Advocate; the Dean of Faculty; the Professor of Agriculture; the Professor of Anatomy; the Professor of Botany; the Professor of Chemistry; the Professor of Natural History.

Members of Council named by Society.—Sir George Clerk, Bart.; Sir W. Gibson-Craig, Bart.; Sir Alexander C. R. Gibson-Maitland, Bart.; George Hope, Fenton Barns; Robert Russell, Pilmuir; Henry Stephens, Redbrae Cottage; John Wilson, Edington Mains.

Board of Examiners.—Science and Practice of Agriculture, Mechanics and Construction—Professor Wilson; George Hope, Fenton Barns; Robert Russell, Pilmuir; and John Wilson, Edington Mains. *Botany*—Professor Balfour. *Chemistry*—Professor Anderson. *Natural History*—Professor Allman. *Veterinary Surgery*—Professor Hallen. *Field Engineering and Surveying*—Professor Macquorn Rankine; David Stevenson, C.E.. *Book-keeping and Accounts*—Kenneth Mackenzie, C.A.; and Archibald Paterson, Meadowfield.

The late Mr Hall Maxwell, C.B.

The Secretary then read the following resolutions of a meeting of the Directors of the Highland and Agricultural Society of Scotland, 3d September 1866. His Grace the Duke of Buccleuch and Queensberry, K.G., President of the Society, in the Chair:—

"1. That the Directors desire unanimously to express the deep and sincere regret with which they have received the information of the death of their late Secretary, Mr John Hall Maxwell, C.B.

"2. That the Society having, in the minutes of the general meeting held on the 17th January 1866, recorded, upon Mr Maxwell's resignation of the office of Secretary, their sense of the remarkable zeal, energy, and ability with which Mr Maxwell had for twenty years discharged the duties of his office, it only remains for the Directors to deplore the loss which they and the Society have now suffered by the death of one whose presence at their meetings, both as an Extraordinary Director and as a member of the Society, would have doubtless proved of great service if his life had been prolonged.

"3. That the Directors request the chairman to transmit a copy of these resolutions to Mrs Hall Maxwell, with their respectful condolence and sympathy upon the occasion of the painful bereavement which Mrs Maxwell and her family have sustained."

The Secretary also read a letter from Mrs Maxwell, thanking the Directors for their communication.

Portrait of the late Mr Hall Maxwell.

The Duke of Buccleuch directed the attention of the members of the Society to an equestrian portrait of the late Mr Hall Maxwell, which had been painted by Mr Gourlay Steell, at a cost of L.250.

New Members.

The Secretary (Mr Menzies) then read the list of proposed members, thirty-five in number, who were then balloted for, and declared by the noble chairman to be duly elected.

Accounts for the Year 1865-66.

Sir William Gibson-Craig submitted the accounts for 1865-66, along with printed abstracts. The accounts were approved of.

Argyll Naval Fund.

Sir William Gibson-Craig laid the accounts of this fund on the table, and stated that Admiral Sir W. J. Hope Johnstone, K.C.B., chairman of the committee, would have been present to report on the fund, but he had been prevented from attending.

Members in Arrear.

Mr Murray of Dollerie said that the Directors had intended to publish the list of members in arrears for four years; but they had resolved to delay the publication of the names of the defaulters for six months, in the hope that before that time they would come forward and relieve them of that disagreeable necessity.

Sir William Gibson-Craig said that since the list had been before the Directors L.82 of the whole arrears, which amounted to L.265, had already been paid; and he hoped that the example thus set would be generally followed.

Life-Composition by Tenant-Farmers.

Mr Walker of Bowland said that the Directors wished to propose an addition to bye-law No. 2, referring to the life-composition payable by tenant-farmers, to make the bye-law the same in substance as bye-law No. 1, referring to the life-composition payable by other members. Bye-law No. 2 at present stood as follows:—

> "*Annual Subscription of* 10*s., and Life-Composition.*—That tenant-farmers, secretaries, and treasurers of local agricultural associations, factors, and proprietors farming the whole of their own lands, whose assessment in the valuation-roll does not exceed L.500, shall pay at admission, and afterwards annually, in advance, the sum of ten shillings, with the option and power of redeeming the same by payment of five guineas as the purchase of a life-subscription."

The Directors propose to add the following:—

> "And which life-subscription may be so purchased under deduction of any annual payment that the member may have previously made, with this limitation, that at no time shall a member have the power of redeeming the annual payments for a less sum than L.3."

The meeting unanimously approved of the alteration. In terms of the charter, the motion must be brought before the general meeting in June before it passes into law.

Steam Cultivation.

The Secretary said that it was the intention of the Marquis of Tweeddale to be here to-day, to present the report of the Committee on Steam Plough-

ing, appointed in February last. But he had been unable to attend, and neither was Mr Gibson of Woolmet present. In their absence he would simply read the report of the committee's proceedings so far as they had gone. The report was as follows :—

"On the 19th of March 1866, the committee made their first inspection, visiting the farms of Messrs Sadler, Ferrygate; Tod, Castlemains; Begbie, Queenston Bank; Hope, Fenton Barns; and Reid, Drem, with the view of examining the work which had been done on these farms after the reaping of the previous year's crop. They found that Messrs Sadler, Tod, and Begbie had worked Fowler's machines; Mr Hope, Howard's; and Mr Reid, Coleman's.

"The inspection occupied two days. About forty fields, extending to nearly 900 acres, were each carefully gone over, and the depths at which each field had been ploughed, smashed, or cultivated, were taken. These measurements were made from the pulverised surface to the solid at the bottom of the furrow; above 150 measurements were taken, and, where necessary, were checked by dipping with the spade; 295 acres had been steam ploughed to an average depth of 10½ inches; 470 acres had been grubbed or cultivated to an average depth of 9¾ inches; and 118 acres had been dug or smashed to an average depth of 11½ inches.

"On the 4th May the committee visited Markle Farm, possessed by Mr Henderson, and saw Mr Fowler's latest improved machine, worked by two engines, which had arrived shortly before from the manufactory. It was harrowing land which had been ploughed in autumn with the common plough, 8 inches deep. Although the soil was clay, and the surface of the furrow very hard, the harrow penetrated and pulverised it well to the depth of 3½ to 4 inches, covering a breadth of 14 feet; it was afterwards sent to grub or cultivate in the same field to the depth of 10½ and 12 inches, and did the work well. The committee were shown other two fields where it had done the work most satisfactorily and with no breakages.

"With the object of arranging to have a comparative test of the produce from land worked by the common plough and that which had been steam cultivated, the committee visited the farms of Messrs Sadler, Tod, Begbie, and Hope on the 4th September. All these were much pleased with the appearance of their crops after steam cultivation, but Mr Sadler alone could favour the committee with a comparative trial of the produce from land cultivated with the common plough and that by steam, and being able to do this with a crop of wheat after potatoes on a field of equal soil, he kindly consented to stack equal portions, and acquaint the committee with the result. This they had not yet received. None of the other parties had crops to which such a comparative test could be applied.

"The committee, not having as yet had an opportunity of inspecting the different machines at autumn work, are now arranging for this to take place on an early day. (Signed) JOHN GIBSON."

The SECRETARY added, that since the dates referred to in this report two inspections had taken place—one, on the 19th November, at Dirleton, where several farms had been visited; and another at Yester, on the 4th December, to examine Lord Tweeddale's horse-ploughing.

The report was unanimously approved of.

THE GLASGOW AND ABERDEEN SHOWS.

Mr KINLOCH, yr. of Gilmerton, reported the preliminary arrangements entered into for the two next general shows of the Society. Some few alterations had been made in the regulations for the Society's shows. He would

only refer to one of these, in No. 8, which applied to ewes and gimmers. The words, "taken from regular breeding flocks" had been struck out, not because it was not in itself an excellent regulation, but because it had been found in practice very difficult to carry out, and the occasion of great wrangling and discontent. All the other changes in the regulations would be found to be on pure matters of detail, and required no special reference.

The Late Earl of Rosslyn.

Mr Kinloch, in concluding his report on the General Shows, said he could not sit down without alluding for a moment to the great loss which the Society had sustained in the death of one who for many years, as chairman of the General Show Committee, had taken an active and leading part in the management of the affairs of the Society. He believed—and he said it advisedly—that to few men was that Society more indebted for its present prosperity and popularity than to the late Earl of Rosslyn. During the past twenty years he had discharged all the duties intrusted to him with honour to himself, advantage to the Society, and so as to secure the esteem and confidence and—he was sure he might add—a large measure of the affection of the agricultural community of Scotland. His open, cheerful, winning expression of countenance, so characteristic of him, was but the reflection of the feeling of his heart. Those who had been in the habit of attending the general shows of the Society would miss him sadly; and they might justly say, as indeed many had already said, that it would be long before they met with one who so fully realised the idea—and it was no mean standard—of a perfect English gentleman. He was sure that it would be in accordance with the feelings and wishes of the meeting that he should move, as he now begged to do, that the Society enter on its minutes a record of their keen sense of the loss they had sustained in the removal of the late Earl of Rosslyn, and their sense of the valuable services he had rendered to the Society.

The Duke of Buccleuch expressed his cordial approval of the motion of Mr Kinloch, and said that it was within the knowledge of them all how anxious Lord Rosslyn was to promote the interests of the Society, and how zealously he discharged his duty in every position in which he was placed. No one was more universally beloved and esteemed than the late Earl of Rosslyn.

The motion of Mr Kinloch was carried by acclamation.

The Secretary stated that, though he had not had formal notice from the Lord Provost of Glasgow respecting the granting of the use of Glasgow Green, or the subscription of L.200 towards the show, he had seen it noticed in the newspapers that such had been done.

District Shows, &c.

Mr Stirling of Kippendavie moved that the sum of L.634 be granted for premiums to district shows during 1867. In the absence of the Convener of the Committee on Cottage Competitions, he had also been requested to move that the sum of L.88 be granted for the encouragement of cottage competitions during 1867. These competitions had become very popular within the past few years, and he was sure they would all be glad to do everything in their power to improve the condition of the cottagers in Scotland.

The grants were unanimously agreed to.

Chair of Agriculture.

Sir Walter Elliot of Wolfelee said he had to bring before them the subject of the better endowment of the Chair of Agriculture in the University of Edinburgh. Much had been done recently by the Commissioners for the Improvement of the Universities in Scotland, and the changes they had proposed had all been agreed to, but the Chair of Agriculture had been omitted.

He observed that, amongst other endowments, they had one in the University of Edinburgh for a chair for the study of Sanscrit Literature, which had been mainly endowed by the liberality of a private gentleman. He could not help feeling that a Chair of Agriculture ought to have found more supporters than that of Sanscrit. At present, however, the Senatus Academicus had brought the subject again before the Government, with the view of securing a better endowment for the Chair of Agriculture. That chair had been founded in 1790, and was supported by an endowment of L.50 a-year from a private individual ; but, with some other minor emoluments, the whole sum for the remuneration of the Professor was not L.100 a-year, really much less than that of any other chair in the University. Besides that, the governing body of the University had no control over the class ; yet, under Professor Wilson's able management and conduct, the class had been most successful, and a num- of excellent students had been turned out by the persèverance of Professor Wilson. This Society formerly made an offer to the Government of a certain sum for the chair, on condition of an equal sum being voted by Parliament ; but the offer had been declined. The Senatus Academicus have memorialised Government upon this matter, and the subject was now before the Treasury. As the matter was pressing, the Directors had taken it upon themselves, at their last meeting, to address the Treasury also on behalf of this chair. He begged now to move the following resolution upon the subject :—

"That the Highland and Agricultural Society learns with pleasure that an effort is being made by the University of Edinburgh to obtain an efficient endowment for the Professor of Agriculture, by an application to the Lords of the Treasury to place this important chair in the same position as the other chairs in the University. The members of the Society are glad to find that the Directors have already addressed the Treasury in support of the memorial, which meets with the entire and cordial approbation of this general meeting, and direct that a copy of this resolution be transmitted to the Lords of Her Majesty's Treasury."

The Chairman said, he thought there could be no doubt that the Society would approve of what had been done for the endowment of this most important chair in the University.

The motion was agreed to.

Veterinary Charter for Scotland.

Professor Balfour said—It will be in the recollection of those present that, at the general meeting of the Society held on the 6th June last, it was agreed to petition against Mr Holland's Veterinary-Surgeons Bill, which excluded any one holding the certificate of the Highland Society only from calling himself a veterinary surgeon (that title being reserved exclusively for members of the Royal Veterinary College), and it was remitted to the Directors to consider the subject of a charter for a Veterinary College for Scotland. With reference to the first matter, it need only be reported that the petition adopted by the Society was sent to every Scotch as well as to several English and Irish members of the House of Commons, and that thereafter Mr Holland withdrew his bill. As to the veterinary charter, the committee appointed on the 6th June, in conjunction with the standing Committee on the Society's Veterinary Examinations, had held several meetings ; and at a meeting of Directors on the 27th June, a memorial to the Privy Council, signed by the Duke of Buccleuch (the president), was forwarded to the Principal Secretary of State for the Home Department. The memorial prayed for the creation and establishment of a Royal Veterinary College in Scotland. The Secretary has since had an interview with the Lord Advocate for Scotland on the subject ; but, owing to an arrangement made by the Government, the matter cannot be taken up till the meeting of Parliament.

The petition referred to is as follows :—

"Unto the Queen's Most Excellent Majesty, in Privy Council assembled, the Memorial of the Highland and Agricultural Society of Scotland, incorporated by Royal Charter, Humbly Showeth—

"That the Society are the patrons of the Veterinary School in Edinburgh, which was established by them in the year 1823.

"That the science of veterinary medicine and surgery has been taught and practised in Scotland for upwards of forty years with ardour and success.

"That hitherto, in the absence of a regularly chartered College of Veterinary Surgeons in Scotland, having authority to appoint examiners and to grant diplomas in veterinary science and art, the certificate of your memorialists, granted after due examination, has served to confer a certain status on veterinary students.

"That this certificate has been recognised since 1838 by your Majesty's Government, and by the Honourable the East India Company, and is the only licence granted in Scotland as qualifying for civil practice in Great Britain and the colonies.

"That your memorialists are of opinion that the past history and present condition of the veterinary schools in Scotland entitle them to the highest consideration of your Majesty, and that the independence and usefulness of these schools would be secured, and the advancement of veterinary science promoted, by the creation and establishment of a Royal Veterinary College in Scotland.

"That the object of the institution of such a college would be to confer degrees in veterinary medicine and surgery on students who produce evidence of having been duly educated in veterinary medicine and surgery, and prove themselves by examination competent to practise as veterinary surgeons.

"That your memorialists humbly but earnestly crave your Majesty's gracious consideration of the above premises; and in the event of this memorial being favourably entertained, your memorialists will be prepared, in concert with other public bodies in Scotland, to submit heads of a proposed charter, and your memorialists will ever pray.

"Signed, in the name and authority of the Highland and Agricultural Society of Scotland.

"Buccleuch and Queensberry, President.

"Edinburgh, 27th June 1866."

Mr M'Lagan of Pumpherston, M.P., said there could be no difference of opinion as to the propriety of the proceedings of the Directors, but he thought the general meeting ought to do more than read reports, and have them laid on the table. It was well that they should know how the question stood at the present time. They knew that last session of Parliament the noble chairman had also been in communication with Government, and had waited on Mr Corry on the subject, and that a deputation, headed by Sir William Stirling Maxwell, also waited upon him, and the case had been fairly stated to the Privy Council. The deputation had been led to suppose that the Privy Council entertained the proposal favourably, but shortly afterwards, to the surprise of every one, the Scotch members found that the Veterinary Bill was intended to be pushed through the House of Commons. At last the bill was withdrawn, and a compromise was made that no veterinary charter should be given to Scotland during the recess. The bill would be again introduced after the meeting of Parliament, and it would strengthen the hands of the Scotch members if the meeting would take a decided step in opposing the bill, and also in applying for a veterinary charter for Scotland. If the Directors had only known the annoyance to which the Scotch members had been submitted last session in opposing the bill, he would not have required to bring the matter up in that way. They had been informed several times that the bill was withdrawn; and when the Scotch members, on the faith of

that information, absented themselves, they were suddenly informed that the bill was before the House. It was only by the closest watching that they were ultimately enabled to frustrate it. They were told that the object of the bill was to improve the education of veterinary surgeons throughout the kingdom; and no doubt that was one of the objects; but the effect of it would have been to annihilate the Edinburgh Veterinary College entirely. They had only the diploma or certificate of the Highland Society in Scotland, which was recognised both by the Government of this country and also in India; but, according to the bill it was proposed to pass, gentlemen holding that certificate would not be allowed to put V.S. to their names, which would be a most anomalous position for gentlemen holding these certificates to be in, and he thought they should take steps to have them relieved from such a position. Besides the Scotch members who waited upon the Privy Council, they found that other bodies had taken up the question; and the College of Surgeons, the College of Physicians, the Town Council of Edinburgh, and the Chamber of Agriculture, had all petitioned against the bill, and had expressed themselves in favour of a charter for Scotland. It now remained for this meeting not only to apply for a charter for Scotland, but to take steps to frustrate the passing of the bill. They were all aware that the late Professor Dick had left a legacy to carry on a college which he had established in Edinburgh, and that the management of it was vested in the Town Council of Edinburgh. Now, should the Town Council be indifferent in this matter, the Highland Society ought to take the initiative; for veterinary science looked to that Society with the affection of a child to a parent, for it had been fostered in this country already by what this Society had done. Now that veterinary science in Scotland was in difficulties, and likely to suffer injury, he hoped the Society would take steps to prevent that injury being passed upon it. Last year one gentleman had fought against the bill almost single-handed, as representing Miss Dick, and certain veterinary surgeons, and the agriculturists of Scotland. He hoped no single gentleman would be allowed to do that, but that they would be united in their attack upon the bill He would suggest that the meeting request the noble chairman to wait upon the Government, immediately after the assembling of Parliament, and endeavour to get them to grant a charter for Scotland; and he had no doubt, if he did so, and was backed by the Society, the application would be successful.

The Chairman confirmed the statements of Mr M'Lagan as to the bill of last session having only been frustrated by the constant watchfulness of its opponents at every stage. He recollected very well that the propriety, and even the necessity, of giving a charter for a Veterinary College in Scotland was pressed upon the Government; but hitherto they had not been successful, and a very strong influence had been brought to bear upon the Government for the purpose of keeping the whole of it in London, so that there should be but one Veterinary College for the whole of the United Kingdom. He would be very glad, if it was the wish of the Society, to take early steps for bringing this matter under the notice of the Privy Council, and a resolution in favour of a charter for Scotland by this Society would strengthen his hands very considerably.

The resolution was unanimously adopted.

Chemical Department.

Dr Anderson reported on the work of the chemical department during the past year, which, he stated, had been unusually heavy, the number of analyses executed for members of the Society having exceeded that of any previous year. Many of these had been of an elaborate character, and had in some instances involved inquiries of some extent, and a great deal of correspondence. The work of the past year had been further increased by the establishment of a system of field experiments, which had entailed a very much larger amount of labour than he had anticipated. This had depended to some extent on the

novelty of this department of the work. A proper system of carrying out these experiments had to be devised; the advice and opinion of many persons conversant with the best methods of experimenting had to be obtained; and many preliminary arrangements had to be made which will either not occur in future years, or which can be carried out much more rapidly. These experiments had been completed with success not unchequered with disappointment. The peculiarly unfavourable season had been against them, and had, indeed, entirely destroyed those of three different individuals. The remainder had been finished with success, and carried with them some very instructive lessons as to the mode of experimenting. He trusted their results would induce the Society to continue, and eventually to extend a plan which was calculated to be of great service to agriculture. A report of these experiments would appear in the Transactions. The extent would, he feared, exclude any other matters from the laboratory; but as a great deal of interesting work had been executed there during the year, he proposed to take an early opportunity of bringing some of it under the notice of a monthly meeting of the Society.

The report was approved of.

Premiums for Essays and Reports.

Mr Irvine of Drum reported the premiums awarded for papers lodged in competition 1866, and laid on the table a list of those offered in 1867.

Proposed Testimonial to Rev. Patrick Bell.

Mr Scot-Skirving, Camptoun, said he had great pleasure, not unmingled with some anxiety, in making the proposition he had now to submit. He had great pleasure, because he was sure what their opinion would be; he had some anxiety lest the success should not be adequate, or that this meeting should not cordially take it up. A number of farmers principally had been thinking for some years that the obligations under which Scottish agriculture lay to the Rev. Patrick Bell were very great indeed. Many of them would have wished to give him some pecuniary testimonial in proof of their feeling on the subject; but, as his Grace was aware, it was difficult for farmers to act in a body except through some society. The proposal he (Mr Skirving) was now about to make was that the Highland Society should give them, not a grant of money, but what they valued much more—their countenance and support, and the valuable assistance of the Secretary in carrying out the plan. It would be necessary to say a few words on the claims of the Rev. Patrick Bell to this honour which he now proposed. The honour of inventing the reaping-machine had been claimed by America, it had been claimed by England, and it had also been claimed by several individuals in Scotland; but a few facts would place the matter before them in its true light. The Rev. Patrick Bell, whom he had not the pleasure of knowing, was far too modest, far too sensible a man to claim to be the originator of the reaping-machine. On the contrary, they all knew that reaping-machines of some kind were used centuries ago; but it was not so old a machine that the records of the world did not let them see beyond. In the very perfect hieroglyphs of Egypt he had seen no trace of a reaping-machine. They had a description given by Homer of reaping which exactly represented a field of Aberdeenshire mowers. But there was no mention of a reaping-machine till Pliny described the fields of Gaul. Pliny stated that the reaper was a large box on wheels, which was pushed into the field by oxen. It was armed with teeth, and these cut off the ears, which fell into the box—exactly what the *Times* in its magnificent way told the English farmers to do last wet season. Now, these ancient machines were not entirely forgotten, because he found the eminent agricultural writer, Mr Arthur Young, in 1785, alluding to them, and proposing that premiums should be given for reaping-machines. Imme-

diately after, two reapers appeared in England—one coming out in 1785, the other in 1786. Mr Scot-Skirving then gave an account of the various machines which had been produced between that date and 1826, when Mr Bell's machine was first worked. Mr Bell was just nineteen when he began to experiment with his machine. He and his brother worked together ; and, as they thought they might be considered lunatics, they did not like anybody to see what they were doing. They wheeled a lot of earth into a shed, and set up straws in it, and worked the machine by stealth. When they got it completed, they took it out first in the moonlight. Their experiments cost a great deal of expense, and the only money they ever received was L.50 from this Society, which did not nearly cover their outlay. In proposing this, he did not ignore the merits of a great many people who had improved upon it ; but he claimed for Mr Bell that he was the first man who constructed a machine which had kept the field. Mr Skirving showed the great expense which had been saved to the farmers by this machine, and proceeded to say that he did not wish the Society to give a money testimonial, although the Society had often done so as the reward of accomplished success. Mr Bell was not in a position to attract attention. He was a minister of the Church of Scotland in one of the poorest parishes, and he believed a pecuniary reward would be more agreeable than if he were a richer man, although rich and poor alike deserved reward for their good deeds. All he asked was that they should empower the Secretary to work the machinery so far as sending out circulars and receiving the contributions was concerned. With that courtesy and kindness which he was sure the members generally experienced at the hands of their new Secretary, he had intimated that he was perfectly willing to undertake the duty, provided the Society would allow the small expenditure that would be necessary in employing for a short time an additional clerk to address the letters, &c. He (Mr Skirving) therefore proposed that the Society should take up the matter, so far as to allow the Secretary to send out the circulars and receive the subscriptions.

Professor Macquorn Rankine, Glasgow, in supporting the proposal, said it was the general impression among engineers that Mr Bell occupied the same position in relation to the reaping-machine as Watt did in relation to the steam-engine. All the reaping-machines that were invented before the days of Bell turned out to be failures, and it was his invention that had rendered them successful, just as in the case of Watt with the steam-engine ; and all improvements that had since been made on the reaping-machine were merely modifications of that of Bell, as the improvements on the steam-engine were modifications of Watt's engine.

The Duke of Buccleuch then put the motion to the meeting as follows :—

> " The meeting approve of the proposal to raise a testimonial to the Rev. Patrick Bell by public subscription, and authorise the Secretary to give his assistance to the gentlemen who are promoting it."

He said that the first time he attended an exhibition in connection with the Highland Society, he recollected perfectly well seeing a model of Mr Bell's reaping-machine on the ground. He was very young indeed at the time, but he remembered hearing many people say of the machine that it might work well enough as a model, but would not be capable of performing the work of the field, because it would be impossible to get horses to push the implement before them. The machine, however, had not only been found practicable to work with, but it was actually used to cut a line to allow other machines to work. He thought the country was under a deep debt of gratitude to Mr Bell for having worked out his idea in such a way as to have rendered the reaping-machine a great success ; and the Highland Society ought to do what they could in order to express their feelings of gratitude to one who stands, as had been well remarked, in much the same position in regard to reaping-machines as Watt did to the steam-engine.

The motion was then put to the meeting, and carried with acclamation.

On the motion of Mr Heddle of Melsetter, a vote of thanks was given to the Duke of Buccleuch for presiding, and the meeting separated.

GENERAL MEETING, 19th JUNE 1867.

His Grace the Duke of Buccleuch and Queensberry, K.G., President of the Society, in the Chair.

New Members.

Seventy-two gentlemen were balloted for, and admitted as members.

Life Composition by Tenant-Farmers.

Mr Walker of Bowland, in the absence of Mr Murray of Dollerie, submitted for final approval the proposed addition to bye-law No. 2, which regulates the life subscription to be paid by tenant-farmers, which was adopted at the last general meeting in January. In terms of this bye-law tenant-farmers can now redeem the life-subscription of L.5, 5s., under deduction of any annual payments that they may have previously made, with this limitation, that at no time shall a member have the power of so redeeming for a less sum than L.3, being six years' annual contributions.

The addition was finally approved.

Execution of Deeds by the Society.

Mr Walker then stated that, in terms of the charter, all deeds and assignations by the Society required to be signed by three of the ordinary Directors, along with the Treasurer, or in his absence by the Honorary Secretary; and that, as it was sometimes impossible for the Treasurer and Honorary Secretary to attend, the Directors begged to submit the following proposed bye-law:—

"That in the absence of the Treasurer and Honorary Secretary, the Acting Secretary for the time being shall be empowered to subscribe, in the manner set forth in the charter, all dispositions or other deeds granted by the Society."

The proposed addition was approved, subject to final sanction at next meeting.

Transactions—No II. of Fourth Series.

Sir Walter Elliot of Wolfelee, in the absence of Mr Irvine of Drum, chairman of the Committee on Publications, laid on the table No II. of the Fourth Series of the Society's Transactions, which completes the first volume, and intimated that it had been forwarded to about 3500 members. If copies had not been sent to all those who wished to have them, they would be transmitted on application to the Secretary.

Premiums Awarded for Essays and Reports.

Sir Walter Elliot reported the awards made for reports since the general meeting in January.

Glasgow Show—Proposal to Aid Show at Dundee.

The Secretary, in the absence of Mr Kinloch, yr. of Gilmerton, the chairman of the Committee on General Shows, reported that the arrangements for the Show at Glasgow on the 30th and 31st July, and 1st August, were in a satisfactory state of advancement.

Mr Hunter of Blackness said he had been requested by Lord Kinnaird to bring under the notice of the Society the Show proposed to be held at Dundee, on the occasion of the visit of the British Association there in September.

He had no doubt the meeting would be a successful one; and though the Association devoted itself mostly to science, it was thought that—visiting a district of country it never before saw—it would not be disagreeable to the *savans* to see a little of our Scottish agriculture. The various local societies had cheerfully come forward in support of the proposed Show, and the principal promoter had been Lord Kinnaird, one of the largest and most enterprising agriculturalists in Scotland. Considering that it was about thirty years since a Show had been held in Dundee—which was so nearly connected with the Carse of Gowrie and Strathmore, one of the most important agricultural districts of the country—he thought that the Society could not dispose of its funds better than by giving a liberal donation to the Show at Dundee.

The Secretary said the application from Lord Kinnaird had been laid before the Directors early in the summer, and they agreed to allow the United Association of Perth, Fife, and Kinross, and the Forfarshire Association, to apply the sums of money voted to them in aid of the Dundee Show. A sum of L.55 and two medals was accordingly allocated to the Dundee Show; but to-day the Directors had agreed to substitute money for these medals.

Mr Sadler, Ferrygate, said he believed an offer had been made by Messrs Fowler & Co., of Leeds, to show implements at the Glasgow Show, and he should be glad to hear what the Directors proposed to do with regard to the subject. In a case of this kind, he thought it would not be inexpedient, and would repay itself by greatly adding to the attractiveness of the Show, to comply with the conditions by Messrs Fowler, and pay half the expenses.

The Chairman said the Directors had considered the subject, and it was their opinion that the request could not be granted. It had never been done upon any former occasion, and if it were now done, there would be great difficulty in drawing the line when they were to refuse such applications. Therefore, he thought it was more prudent that the Society should not undertake the expense of bringing implements or other things to the Show.

Mr Hunter said he thought the subscription proposed to the Dundee Show was so small that it was doubtful whether it would be accepted at all. Such a Show could not be conducted without great expense, and considering the large sums given by private individuals, the sum of L.50 was hardly worth their acceptance from so rich a Society.

Testimonial to the Rev. Patrick Bell.

Mr Scot-Skirving, Camptoun, had much pleasure in announcing that the committee had obtained the sum of nearly L.800 for the testimonial to Mr Bell, of which they proposed to pay Mr Bell L.600 immediately to account.

The Chairman proposed, on behalf of the Directors, that the sum of L.100 should be contributed to the testimonial to Mr Bell.

The proposal was received with loud applause, and the Chairman declared it to be the unanimous opinion of the Society that such grant should be made.

Agricultural Education.

Professor Balfour reported that the examinations for the Society's agricultural certificate and diploma had taken place on the 11th, 12th, and 13th March, when the following gentlemen passed the necessary examinations:—

For Certificate and Diploma.

1. Robert Brydon, Burncastle, Berwickshire.
2. George Kent Walton, Long Compton, Warwickshire.

For Certificate.

1. James Cooper Bowstead, of Halkthorpe Hall, Penrith.
2. Thomas John Elliot, Wilton, Salisbury.

He also reported that the prizes of L.6 and L.4 annually allowed by the Society to the students who pass the best and second best examinations in

the agricultural class in the University of Edinburgh had this year been awarded to the following gentlemen :—

1. Richard George Scriven, Northamptonshire.
2. Robert Brydon, Burncastle, Berwickshire.

Veterinary College.

In the absence of Mr Gillon of Wallhouse, who had been recently appointed chairman of the Society's Veterinary Committee, Mr Campbell Swinton of Kimmerghame reported that the annual examination of the students had taken place on the 16th and 17th of April, when the Society's veterinary certificate or diploma had been conferred on the following thirty out of thirty-eight candidates :—Henry Tait, Meigle ; James Anderson, Glasgow ; Parlan M. Walker, Luss, Dumbartonshire ; James Pace, Selkirk ; Thomas Peckett, Liverpool ; Andrew Pender, Dura, Wishaw ; Robert C. Edwards, Derby ; David M'Lean, Renfrewshire ; A. J. M'Callum, Maybole ; Samuel Greenlees, Manchester ; David Pollock, Cumbernauld ; Averell Watson, Limerick ; John M'Ewen, Killen, Lochtayside ; John Lorimer, Fordyce ; Robert Dawson, Strathdon ; Angus Campbell, Toward ; Alex. Stuartson, Aberdeenshire ; William Anderson, Bourtie ; Joseph Ackroyd, Cullingworth ; Peter Beattie, Kemnay ; James Reilly, Oristown ; Alex. G. Rolls, Weymouth ; George Fowlie, New Deer ; Donald Sutherland, Thurso ; Patrick O'Conner, Limerick ; James C. Berne, Navan ; William Boyd, Kelso ; Joseph Smith, Chorley ; William Maloney, Clare, Ireland ; William Smith, Ulverstone. The examinations on this occasion had been attended by the Lord Provost and Magistrates, and had as usual been conducted by several of the most eminent members of the Colleges of Physicians and Surgeons, and also by a number of distinguished veterinarians from England as well as Scotland. Silver medals were awarded to the students who passed the best examinations in chemistry, materia medica and dietetics, anatomy, cattle pathology, physiology, diseases of horses, and best general examination.

The report was approved of.

Veterinary Charter.

Mr Swinton said that members of the Society were aware that great anxiety had been expressed for a considerable time to obtain a charter for a Veterinary College in Scotland, so that they should not be brought into connection with the Royal College of Veterinary Surgeons. Negotiations were going on with the Privy Council upon the subject, and the Directors of the Society had received the most cordial co-operation from the Town Council of Edinburgh, who were greatly interested in the school of veterinary science here, on account of the charge devolved upon them by the generous bequest of the Veterinary College from the late Professor Dick. Communication had been opened up with the Privy Council, and a draft charter was in course of being prepared, which would have to be submitted to the public bodies here interested in the matter, and which, above all, would require the sanction of the Privy Council. The negotiations were in a state of very great forwardness, but were not so near completion as to warrant a detailed report. In these, as in other negotiations, the Society was under infinite obligation to the noble President for the interest he had taken in the matter, and the influence he had used with the authorities in England.

The Duke of Buccleuch said, with regard to the charter, that he had been in communication with the Committee of the Privy Council on the subject, both in writing and verbally, and the matter was proceeding as rapidly as circumstances would permit. A draft charter was now under consideration by the Town Council and the Directors of the Society, and it would as soon as possible be submitted to the Privy Council. Of course, it would be subject to

any alterations which the Privy Council and the law officers of the Crown might think necessary to make upon it.

Resignation of Professor Hallen—Appointment of Mr Williams.

Mr Swinton further reported that Professor Hallen had resigned his appointment as Professor of Veterinary Surgery to the Society, in consequence of his being required to return to his duties under his commission in Her Majesty's Indian service, and that the Directors had to propose in his place Mr William Williams, of Bradford, who had been appointed Principal of the Edinburgh Veterinary College. Mr Williams is a graduate of the College, and holds the Society's certificate or diploma.

The proposal of the Directors was unanimously adopted, and Mr Williams was appointed Professor accordingly.

Chair of Cattle Pathology.

Mr Swinton reported that the Directors had had under their consideration the expediency of establishing a Chair of Cattle Pathology in connection with the Dick College, and at a meeting of the Board on the 5th June, it was resolved to recommend to the general meeting that an annual vote of L.100 should be given for five years, on the condition that the patronage of the Chair be vested in the Society, so long as the grant was paid by it. If the proposal met with the sanction of the general meeting, the Directors were of opinion that it should be remitted to a committee—two to be named by the Society and two by the Town Council—to make such regulations as might be considered necessary for the proper conduct of the Chair.

The report was unanimously adopted.

Chemical Department.

Dr Anderson reported that the work during the last half-year had been mainly confined to the performing of analyses for the members. The work in this way had been very large. They had had to consider a number of important cases of adulteration, and in some instances had thus succeeded in protecting the interests of members of the Society. They had also been engaged in arranging for field experiments. The experiments were, so far, a following out of those of last year. Seed had been sown and preliminary steps taken with a view to developing their knowledge of manuring; but the experiments, this year, would be connected with other ordinary operations of the farm in such a way as was likely to make the experiments more generally interesting and useful to farmers than those of last year. They had several matters of investigation in hand, of which the results would be published in due time.

Steam Cultivation.

The Secretary read a letter from the Marquis of Tweeddale, who has charge of this subject, stating that, if there had been anything to report, he would have attended the meeting. The Secretary added that the Committee on Steam Cultivation had determined that their reports should cover a series of two years. No report, therefore, would be issued till next year, and Lord Tweeddale had not thought it necessary to be present to make any statement till nearer the time for publishing the report.

This concluded the business, and the meeting separated shortly before two o'clock, after passing, on the motion of Mr Wardlaw Ramsay, a vote of thanks to the Duke of Buccleuch for his conduct in the chair.

GENERAL MEETING, 15TH JANUARY 1868.

In absence of the President and Vice-Presidents, the Most Noble the Marquis of Tweedale, K.T., one of the former Vice-Presidents, took the Chair, and constituted the meeting.

The late Sir George Clerk.

The noble Chairman said he regretted much that the first matter he should have to bring before them was the lamented death of Sir George Clerk, who had been so long a faithful servant of the Highland Society, and who had always taken the deepest interest in agriculture and in natural science.

The Secretary then read the following resolution of the Directors, which was approved of, and ordered to be engrossed:—

"Before proceeding to the business of the day, the Directors resolved to record in their minutes the deep regret with which they regard the death of the Right Hon. Sir George Clerk of Penicuik, Bart., and to express their sense of the valuable assistance which the Society had for many years received from him as Honorary Secretary, and as a member of the Council on Agricultural Education."

On the motion of the noble Chairman, Sir William Stirling-Maxwell was appointed to succeed the late Sir George Clerk as Honorary Secretary, and Lord Colonsay was appointed in his stead a member of the Council on Agricultural Education.

Establishment for 1868.

In conformity with the recommendation of the Directors, the following were elected office-bearers for 1868:—

President—His Grace the Duke of Buccleuch and Queensberry, K.G.

Vice-Presidents—The Earl of Dalhousie, K.T.; the Earl of Fife, K.T.; the Earl of Southesk; the Earl of Kintore.

Extraordinary Directors—Sir Michael R. Shaw-Stewart, Bart.; Sir James Fergusson, Bart., M.P.; Sir Walter Elliot of Wolfelee, K.S.I.; Archibald A. Spiers of Elderslie, M.P.; Sir James Horn Burnett, Bart.; Sir Alexander Bannerman, Bart.; John Gordon of Cluny; Alexander Forbes Irvine of Drum, Lieutenant-Colonel M'Inroy of the Burn; Alexander Morison of Bognie.

Ordinary Directors—Sir Alexander C. Ramsay Gibson-Maitland, Bart.; George Robertson Barclay of Keavil; John Dudgeon, Almondhill; Robert Dundas of Arniston; William Goodlet, Bolshan; James Roberton, Ladyrig; John Stirling of Kippendavie; Archibald Campbell Swinton of Kimmerghame; William Stuart Walker of Bowland; Sir Thomas Buchan Hepburn, Bart.; William Wallace Hozier, yr. of Mauldslie; Colonel William Mure of Caldwell; Thomas Park, Stoneyhill; Walter Reid, Drem; Graham Somervell of Sorn; Graham Binny, W.S., Edinburgh; Colonel Archibald Campbell, yr. of Blythswood; Colonel Joseph Dundas of Carronhall; Robert Elliot, Laighwood; James Geddes, Orbliston; John Ord of Muirhouselaw; Major John Ramsay of Barra; Robert Russell, Pilmuir; Sir James Gardner Baird of Saughton Hall, Bart.; Hew Crichton, S.S.C., Edinburgh; Charles Lawson of Borthwick Hall; Alexander M'Dougal, Granton Mains; Thomas Mylne, Niddrie Mains; Thomas Coutts Trotter, Bilston Lodge; John Wilson, Edington Mains.

Office-Bearers—The Right Hon. Sir William Gibson-Craig of Riccarton, Bart., Treasurer; Sir William Stirling-Maxwell of Keir, Bart., M.P., Hon. Secretary; Fletcher Norton Menzies, Secretary; Rev. James Grant, D.C.L., D.D., Chaplain; Thomas Anderson, M.D., Professor of Chemistry, University of Glasgow, Chemist; Kenneth Mackenzie, C.A., Auditor; John Wilson,

Professor of Agriculture, University of Edinburgh, Professor of Agriculture; W. J. Macquorn Rankine, LL.D., Professor of Civil Engineering, University of Glasgow, Consulting Engineer; Alexander Slight, Practical Engineer; Gourlay Steell, R.S.A., Animal Portrait Painter; William Williams, Professor of Veterinary Surgery; John Adam M'Bride, Professor of Cattle Pathology; Thomas Duncan, Clerk; John M'Diarmid, Junior Clerk; William Blackwood & Sons, Publishers; Neill & Company, Printers; Mackay, Cunningham, & Co., Silversmiths; Alexander Kirkwood & Son, Medallists; John Watherston & Sons, Inspectors of Works; William M'Neill, Messenger.

Chairmen of Standing Committees.—Argyll Naval Fund—Admiral Sir William J. Hope Johnstone, K.C.B. *Chemistry*—Professor Anderson. *Cottages*—Harry Maxwell Inglis of Logan Bank. *District Shows*—A. Campbell Swinton of Kimmerghame. *Finance*—Anthony Murray of Dollerie. *General Shows*—Alexander Kinloch, yr. of Gilmerton. *House and Buildings*—John Ord Mackenzie of Dolphinton. *Machinery*—John Gibson, Woolmet. *Premiums for Reports on the Science and Practice of Agriculture*—Professor Lyon Playfair, C.B. *Premiums for Reports on Woods and Plantations*—Professor Balfour. *Publications*—Alexander Forbes Irvine of Drum. *Veterinary College Examinations*—Andrew Gillon of Wallhouse.

Council on Agricultural Education.

Members of Council named by Charter.—The President of the Highland and Agricultural Society, *President.* The Lord Justice-General, *Vice-President.* The Lord Advocate; the Dean of Faculty; the Professor of Agriculture; the Professor of Anatomy; the Professor of Botany; the Professor of Chemistry; the Professor of Natural History.

Members of Council named by Society.—Lord Colonsay; Sir W. Gibson-Craig, Bart.; Sir A. C. R. Gibson-Maitland, Bart.; George Hope, Fenton Barns; Robert Russell, Pilmuir; Henry Stephens, Redbrae; John Wilson, Edington Mains.

Board of Examiners.—Science and Practice of Agriculture, Mechanics and Construction—Professor Wilson; George Hope, Fenton Barns; Robert Russell, Pilmuir; and John Wilson, Edington Mains. *Botany*—Professor Balfour. *Chemistry*—Professor Anderson. *Natural History*—Professor Allman. *Veterinary Surgery*—Professor Williams. *Field Engineering and Surveying*—Professor Macquorn Rankine, and David Stevenson, C.E. *Book-Keeping and Accounts*—Kenneth Mackenzie, C.A., and Archibald Paterson, Meadowfield.

Mr Harvey, Whittingham Mains, said he had no intention of causing discontent and dispute, but there was a matter which had caused a little dissatisfaction—namely, the appointment of the General Show Committee. He would like to know who the gentlemen were composing it. The Society did not appoint the committee. It fell to the Directors to do so; and at last Glasgow Show there had been great dissatisfaction with the judges, particularly of sheep. The Board of Directors included many practical men, but there were also a good number of ornamental Directors, who knew little about practical agriculture, or about blackfaced or Cheviot sheep. He wished to throw a little more popularity into the committee; and though he knew it was impossible to appoint judges who would please every one, yet certainly he thought more practical men might be appointed.

Mr Menzies read the names of the gentlemen constituting the Show Committee.

Mr Kinloch remarked that the list included a good many practical men.

Mr Harvey admitted that it did, but he had not known before who they were.

Mr Hunter of Blackness thought the system of electing directors in a lot ought not to be followed, but that every candidate should be individually

named and seconded. The public would thus have an opportunity of knowing whether the person proposed was fit to be a Director or not. He had no doubt that if a tenant-farmer who had gained high and great honours in the sister country, having beaten the whole of England—Mr M'Combie of Tillyfour—were elected, he would do credit in the Directorate. If he were proposed now, he would not have a chance of being elected; but if his name were individually proposed and seconded, he would like to see the name that would stand higher. He (Mr Hunter) was altogether opposed to the system of a closed list; and if some other system was not adopted they would have more of the noise they had in the Society some time ago. The matter was one worthy of the attention of the Society and of the Directors.

The matter then dropped.

New Members.

Fifty-five gentlemen were then balloted for, and admitted as members.

Accounts for the Past Year.

The Right Hon. Sir William Gibson-Craig, the Treasurer, laid on the table the accounts for 1866-67, with printed abstracts, which were approved of.

Argyll Naval Fund.

Admiral Sir W. Hope Johnstone reported the condition of this fund. He stated that it had been instituted in 1806 by John Duke of Argyll, first President of this Society, who presented to the Society the sum of L.1000 to be applied to the education for the naval profession of the sons of gentlemen connected with the Highlands, and not in affluent circumstances. At that time it was expected that other contributions would be made, but the expectation was not realised. The fund was left untouched till 1826, when it had accumulated to L.2300, and the committee then resolved to apply the interest to the object of the founder. The interest at that time would only admit of three young gentlemen being placed on the fund, at the small annual allowance of L.20 each. In 1844, by further accumulations, the committee were enabled to add a fourth to the list, and to increase the allowance to L.40. Last year they were able to add a fifth, and at present there were five young gentlemen on the fund, appointed in the following years, 1861, 1862, 1863, 1864, and 1867; each being entitled to hold the grant till they received the commission of lieutenant in the Royal Navy. The fund now amounted to L.5200, invested in heritable security, and the regulations had been altered from time to time as required by changes of circumstances in the navy. Sir William also said on the table the accounts of the fund.

Execution of Deeds by the Society.

On the motion of Mr Murray of Dollerie, the bye-law in regard to execution of deeds was confirmed. It is as follows:—"That in the absence of the Treasurer and Honorary Secretary, the Acting Secretary for the time being shall be empowered to subscribe, in the manner set forth in the charter, all dispositions or other deeds granted by the Society."

Glasgow Show—1867.

Mr Kinloch, yr. of Gilmerton, reported that this Show had been a great success, far exceeding the most sanguine expectations. The entries in some of the classes were not so numerous as they might have hoped for under more favourable circumstances; but in the opinion of the most competent judges, the quality of the stock, taken as a whole, had never been excelled at any previous Show. Referring to the abstract of the accounts, they would notice that, after paying all expenses, the handsome surplus of L.1307, 2s. 6d. remained at the credit of the Society. He was particularly glad to report the great suc-

cess which had attended the first Show held by their new Secretary. He was to be congratulated on the success of his first essay. His courteous attention to all comers well merited acknowledgment, while it had secured his position as manager of the showyard. Having very carefully watched the whole details of the Show, Mr Menzies had noted many things which he thought might be advantageously altered in the future management of the yard. He would not follow Mr Harvey into the vexed question of the appointment of the judges. He would only remind him that the Directors now appointed the judges, and not the committee of the General Show, and he ventured to say on the part of the Directors that they would be ready to give every attention to any well-considered proposal that might be submitted on this point. It would, however, take a very strong case to induce them to depart from the recommendations of the committee, which were submitted to the Directors in 1860, and approved of at that time. Mr Kinloch then moved the following resolutions :—

"1. That the thanks of the Society be communicated to the Lord Provost, Magistrates, and Town Council of Glasgow for the assistance and co-operation accorded by them on the occasion of the Society's Show at Glasgow in August last, and more particularly for the gratuitous grants of the Green for the showyard, and the City Hall for the banquet, as well as the liberal contribution of L.200 in aid of the auxiliary fund.

"2. That the success of the Glasgow Show was greatly promoted by the personal exertions of the Hon. James Lumsden, Lord Provost of Glasgow, and that the thanks of the Society be tendered to his Lordship for the able manner in which he discharged the duties of chairman at the public banquet, in the unavoidable absence of His Grace the Duke of Buccleuch, the President.

"3. That the thanks of the Society are due to the Commissioners of Supply for the counties of Lanark, Ayr, Renfrew, Argyll, Bute, and Arran, for the liberality with which the local subscriptions were provided for the Glasgow Show.

"4. That the thanks of the Society are due to the Right Hon. Lord Belhaven and Hamilton, K.T., chairman of the Committee of Superintendence, elected by the different counties connected with the Glasgow Show, and to the members of that body, as well as to the local agricultural associations in the district, for their zealous and valuable co-operation in carrying out the various arrangements of the meeting."

The votes were passed unanimously.

Aberdeen Show—1868.

Mr Kinloch reported, with regard to the Aberdeen Show, that the premium list had now been finally arranged, strictly in accordance with the wishes of the district. He mentioned that the premiums and medals to be awarded at the Aberdeen Show would amount to L.1500, and that there would be an additional expenditure in connection with it of L.1700. The counties of Aberdeen and Banff had assessed themselves for L.490 and L.120 respectively, and it was expected that the county of Kincardine and the eastern portion of Forfarshire would subscribe as they had hitherto done. The Town Council of Aberdeen and the Royal Northern Agricultural Society had promised the same assistance and accommodation which they had given in 1858. He had also to announce that Mr Irvine of Drum, convener of the county of Aberdeen, had been appointed chairman of the Committee of Superintendence, and they might feel sure that if the others associated with him exerted themselves as Mr Irvine would do, there would be no doubt as to the success of the Show. The Show would take place on the 28th, 29th, and 30th of July, which was earlier than usual, but they had fixed upon these days in order not to interfere with the Shows of the Royal Agricultural Society of England and of the Yorkshire Society.

Edinburgh Show—1869.

Mr Kinloch reported that the Directors had received a numerously-signed requisition from the proprietors of the three Lothians, praying that the Show in 1869 should be held at Edinburgh. The Directors had agreed to this request, and had remitted to the Show Committee to draw up a list of premiums. This they had done, and a list was now on the table. There would be plenty of time before next year to receive suggestions regarding it, and make any alterations that might be necessary. The meeting approved of the Show being held at Edinburgh in 1869.

Local Competitions.

Mr Campbell Swinton, chairman of the Committee on District Shows, laid on the table the report of the committee, from which it appeared that during last year 221 competitions of various kinds had taken place, namely, stock, 22; minor premiums and medals, 50; ploughing competitions, 149. The Society has besides contributed to the funds of the Dundee Show, and the Edinburgh Christmas Club, making a total expenditure of L.705. Mr Swinton then moved that the sum of L.600 be voted for premiums during 1868. The grants the Directors proposed were, he said, distributed over the whole of Scotland, and comprised at least as many districts as in 1867.

The motion was agreed to.

The Chair of Agriculture in the University.

Mr Campbell Swinton said he had to bring before this meeting for their consideration, and he trusted for their approval, a proposal to make a grant for a certain number of years towards the endowment of the Chair of Agriculture in the University of Edinburgh. He might state that this was not a new subject to the members of the Society. It was brought before the general meeting some years ago, not at the instance of the Directors, but by several independent members of the Society. A representation was made by them at that time to the Directors that it was very desirable to take into consideration the propriety of the Society endowing the Chair of Agriculture—a Chair which at present received the miserable endowment of L.50 a-year from funds which had been in existence for a number of years. The matter was fully considered in 1862 when the Universities Commission was sitting, and it was thought that that was a suitable opportunity to contribute a sum from the funds of the Society, provided the Commissioners would contribute from the funds at their disposal a like sum. To the regret of the Directors, an unfavourable reply was ultimately received from the Commissioners, in consequence of the sum placed at their disposal being so limited, considering the many claims they had to take into consideration. Within the last few weeks, however, a deputation from the Senatus Academicus had waited upon the Directors, and had represented that a favourable opportunity had now occurred for renewing this offer. A gentleman resident in Edinburgh, with most commendable liberality, had presented the University with no less a sum than L.5000 for the purpose of forming an endowment for a Chair of Engineering. In consequence of that a representation was to be made to the Government to supplement the funds which that munificent donation would provide by a like grant of public money for the Chair of Engineering. A deputation from the University and from different public bodies in Edinburgh was to proceed to London, and would lay that matter before Her Majesty's Government, and they would also take part in a general congress about to be held in London on the subject of technical education. The Society were, therefore, only asked to express their willingness to do the same thing that they had offered to do in 1862; and it was proposed to limit the present offer of a grant from the Society to an annual sum for ten years, it being, however, understood that the

grant from both sources should be continued if the Chair on its new footing proved successful. In the negotiation with the University Commissioners, it was thought fit to suggest that the Highland Society should have some voice in the patronage of the Chair. The committee, however, reported their opinion that the Society should not seek for any alteration, especially as an Act of Parliament would be required for that purpose. "The present patrons," said the report, "are the Lords of Session, the curators, and the University Court (three delegates from each), and your committee are of opinion that a body so constituted is well worthy of the confidence of the Society." Mr Swinton proceeded to state that a supplementary report had been drawn up by Professor Lyon Playfair and Professor Balfour, stating the arrangements which should be adopted in the event of the endowment being granted, so as to make the Chair not an isolated one, but that it should be brought into connection with other chairs—such as Botany, Natural Science, and Chemistry—and a regular curriculum of agricultural education adopted. It was also suggested that certificates of proficiency should be granted to the students in addition to the diploma they might receive from the Highland Society on passing the necessary examinations. The Senatus expressed their willingness to have assessors from the Society to act along with them in prescribing the examinations, in appointing the examiners, and otherwise assisting to make this a great department of the University. It was thought that if this Chair of Engineering was established on a similar footing, it would form the basis for a university technical education, as the Chair of Agriculture would for an agricultural education. It was also believed that if the Chair of Agriculture was so established, a great impulse would be given to the study of agriculture as a branch of university education. The proposal of the Directors was to offer L.150 per annum, if the Government would give L.200, in consideration of that sum, and the L.50 of present endowment. Mr Swinton concluded by moving the approval of the proposal.

The motion was unanimously agreed to; and the Directors were authorised to make, in concert with the Senatus Academicus, the necessary application to Government.

Proposed Veterinary Charter for Scotland.

Mr Gillon of Wallhouse reported the proceedings which had been taken since last meeting by the committee on a charter for the Veterinary College of Scotland. Since the general meeting in June a draft of a veterinary charter had, he said, been prepared, and forwarded to the Principal Secretary of State for the Home Department, by whom it had been referred to the President of the Board of Trade. By desire of the Directors, a communication, accompanied by a copy of the Society's memorial, had been sent to the convener of every county in Scotland, and it was believed that, with one or two exceptions, all the counties had adopted memorials in favour of a veterinary charter for Scotland. A very influential deputation, consisting of six Peers, nearly all the Scotch Members of Parliament then in London, the Lord Provost of Edinburgh, a number of leading veterinarians holding the Society's diploma, besides several other gentlemen, waited, according to appointment, on the Duke of Richmond, the President of the Board of Trade, on the subject. The object of the deputation had been fully stated by the Lord Provost on behalf of the Corporation of Edinburgh, and by Mr Campbell Swinton on the part of the Highland Society. The deputation had been very much indebted to Lord Colonsay, who explained that, on a proper construction of the charter of the English College, monopoly was not to be inferred. The Duke of Richmond stated that the subject would receive his best consideration, but he reserved his decision till he heard the case of the Royal College of Veterinary Surgeons, a deputation from which was to wait on him on the 28th November. At a recent meeting of the Veterinary Committee of the Highland Society,

it was agreed, after consulting the Town Council Veterinary Committee, that the trustees to be named in the proposed charter should stand as follows:—Three persons elected by the Highland Society; the Lord Provost and another elected by the Town Council of Edinburgh; the Lord Provost and another elected by the Town Council of Glasgow; one person elected by each of the Universities of Edinburgh, Glasgow, Aberdeen, and St Andrews; and one person elected by each of the Royal Colleges of Physicians and Surgeons of Edinburgh; the Principals of Edinburgh and Glasgow Veterinary Colleges, and ten veterinary surgeons—in all, 25.

Dr Dalzell, Veterinary College, Edinburgh, thought it only respectful to this Society, and in accordance with the wish of the whole veterinary profession in Scotland, that he should return their thanks for the interest the Society had taken in this matter. One objection which had been made to granting the charter was that it had not been called for by the profession. A meeting of veterinarians was accordingly called by circular, and held in 5 St Andrew Square, at which upwards of one hundred members of the profession were represented. He was glad to say that now upwards of 232 signatures had been obtained to the memorial praying for a Scotch charter. About seventy of the signatures were obtained in England and Ireland, but still as it was estimated that the number of veterinarians in Scotland was not over 280, they had thus obtained the signatures of upwards of two-thirds of the veterinary profession.

Chemical Department.

Professor Anderson reported his proceedings in the chemical department. He stated that the work done for the Society had been under the average, although a considerable amount of heavy practical work had been accomplished. He had advanced some distance in his investigations into the different substances used for smearing and dipping sheep; but there was a great deal of detail to be accumulated before he would venture to lay his results before the Society. The general work of the department now included the supervision of the field experiments, and this involved a great deal more work than he had at all anticipated. He had now completed the second series of experiments, and had been anxious to obtain some definite information and advice as to the best mode of conducting these experiments. He had issued a schedule of queries to a number of members of the Society, and was now awaiting the returns.

Premiums Awarded for Essays and Reports.

Mr Irvine of Drum reported the premiums which had been awarded for essays and reports since last general meeting.

Premiums Offered for Essays and Reports.

Mr Irvine also announced the premiums for 1868, and stated that it was proposed to vote L.290 for reports on subjects connected with the science and practice of agriculture, L.35 for land improvements, L.50 for agricultural machinery, and L.60 for woods and plantations—in all, L.435. The premiums were approved of.

Mr Elliot, Laighwood, referred to the representations that had gone abroad, and which he believed were quite unfounded, that a great many of the essays which received prizes were locked up in the drawers of the Society, instead of being published for the use of the public.

Mr Irvine of Drum said that this had been the fate of very few indeed of the prize essays, and this had only taken place when the matter was felt not to be of such general interest as to warrant publication. He did not believe that L.50 had been spent on essays in twenty-five years which had not been published.

Transactions for 1868.

Mr Irvine of Drum, chairman of the Committee on Publications, reported that the Transactions for 1868 would be published in February. The usual preliminary notice will be superseded, as the Directors have resolved to include in the Transactions the proceedings at the half-yearly general meetings as well as an abstract of the business at the Board meetings. In arranging the order of publication, provision has been made for the separation of the prize reports from the premium lists and other official documents. All reports of experiments will in future be brought out, if possible, within a year of the award, the Directors having with this view extended the Transactions to 22 sheets of 16 pages, in place of between 18 and 20 sheets. Estimates for printing the Transactions were taken in June last, and the tender of Messrs Neill & Company, of Edinburgh, was accepted. Messrs William Blackwood & Sons, Edinburgh, have again been named publishers, and non-members will be supplied with copies on application to them.

Improvement of Farm Buildings and Cottages.

The Hon. G. Waldegrave Leslie, M.P., drew attention to this subject, remarking that in consequence of the difficulties encountered in London in getting loans from the Enclosure Commissioners for improvements in Scotland, and of parties being tied down to plans which might be very suitable for England, but which were quite unsuited for Scotland, there had come to be an almost total cessation of the demands for moneys under these Acts. He had had the honour of bringing the subject before Parliament, and every one agreed with him that in the office of the Enclosure Commissioners there was great ignorance displayed as to the wants of Scotland, and that the conditions insisted in were quite inapplicable to Scotland. He had had the honour of being a director of the Cottage Improvement Association, and he found that very few demands had gone up to the commissioners, owing to these great impediments. He had spoken to the Lord Advocate on the subject, who, without committing himself to anything, had expressed himself favourable to the object of the resolution which he now begged to propose, namely—

> "That, inasmuch as the system of supervision of drainage and land improvements by local inspectors in Scotland, under the authority of the Government Enclosure Commissioners, has been found to work in a satisfactory manner, it is the opinion of the Highland and Agricultural Society of Scotland that a like system of supervision as regards the plans and erection of farm-buildings and cottages, under Improvement Acts, be entrusted to the supervision of an architect in Scotland, to act under the authority of the Government Enclosure Commissioners; and that the Right Honourable the Lord Advocate be furnished with a copy of the above resolution, and be requested to do his utmost to carry it into effect."

Mr M'Lagan, M.P., seconded the motion. He said he had had the honour of being a director of the Cottage Association, and brought the subject before the meeting some time ago. The cottages which it was insisted should be built in Scotland were similar to those in England, and differed so materially from those required in Scotland, that it was found absurd to erect cottages which would be very good for England, but were useless in this more northern climate. He was most happy to second the motion, and he would do all he could to support Mr Waldegrave Leslie here and in another place, if he brought the proposal forward in the form of a bill.

The resolution was unanimously carried.

Mr M'Lagan proposed a cordial vote of thanks to the noble Marquis for presiding. They must all rejoice to find him again taking an active part in the business of the Society, for which he was so well fitted by his

thorough knowledge of practical agriculture. He hoped the noble Lord would long be spared to take an active part in the Society's business.

The noble MARQUIS briefly acknowledged the compliment, expressing his earnest desire to do all he could to promote the interests of agriculture and the welfare of the Society.

This concluded the business of the meeting.

THE TESTIMONIAL TO REV. PATRICK BELL.

At the close of the meeting of the Highland Society, the subscribers to the Bell Testimonial remained to witness the presentation. The Marquis of Tweeddale presided.

Mr SCOT-SKIRVING, Camptoun, said he had the honour, as Convener of the Committee of the Bell Testimonial, to request his Lordship to do the subscribers the favour of presenting it. He might congratulate Mr Bell upon the fact that he would receive the testimonial from his Lordship's hand; and they would all agree with him in thinking that he could not receive it from more appropriate hands than those of so eminent an agriculturist and of so eminent an inventor and improver of agricultural machines. Had Mr Bell been as richly endowed with this world's goods as they could all have wished him, they would have given him a handsome service of plate; but, occupying as he did one of the scantiest livings of the Church of Scotland, they had thought it much more appropriate to give him a testimonial in money; and the little piece of silverplate which accompanied it was intended more as a means by which he would be enabled to hand down a knowledge of the fact to posterity. The salver bore the following inscription:—

"Presented to the Rev. Patrick Bell, minister of Carmyllie, with the sum of L. , by a large number of his countrymen, in token of their appreciation of his pre-eminent services as the inventor of the first efficient reaping-machine. Constructed 1827.—Edinburgh, January 1868."

The committee were exceedingly anxious that they had been able to say that the gross sum amounted to L.1000, and he was happy to say that, from subscriptions which had been announced since they met, it was now only about L.30 short of that sum; and there was a simple way of making it up by gentlemen adding to their subscriptions before they went away. He (Mr Scot-Skirving) would take the liberty of making one remark with regard to inventions. He had often heard it remarked that they were the result of accident or chance. There was scarcely any great invention or any great discovery in science of which this had not been said. One of the most hackneyed examples was the discovery of gravitation by the immortal Newton. He had read a hundred times that the discovery was the result of Newton seeing an apple fall. Now, apples had fallen since the time they first grew in Eden; but it was only when seen by Newton that the great idea flashed across his mind. Now, he never had the pleasure of seeing Mr Bell before, and he was not going to flatter him in his presence; but to show that it was not from accident he became an inventor, he would compare one passage in his life with that of a very different man—Burns. Burns, in one of his best poems—the poem in which he spoke of the thistle in a way which the inventor of a reaping-machine or an agricultural society were not likely to do—once, in his youth, on returning from the reaping-field, exclaims—

> "I felt a wish—I mind its power—
> A wish that to my latest hour
> Will strongly heave my breast—
> That I, for puir auld Scotland's sake,
> Some useful plan or book might make,
> Or sing a sang at least."

Now, he (Mr Scot-Skirving) had read in the earliest notices Mr Bell gave this Society of the reaping-machine this account of the invention :—He said he was coming home from seeing his father's reapers at work, and a strong wish seized him to invent some machine to lighten the labour of his countrymen. He saw a pair of garden shears hanging near, and that was his first idea of clipping corn by machinery. Burns did not make "a useful plan," but he sang songs which had cheered the baronial hall as well as the humble cabin ; and Mr Bell, by his machine, had saved a world of trouble to the labouring classes, and a vast sum of money to the agricultural world. It was now forty years since this machine was invented ; and if this was a tardy acknowledgment, they could at least say that it was the mature opinion of the people of Scotland, founded on experience, that they were permanently indebted to the invention of the reaping-machine in 1827 by the Rev. Patrick Bell. He concluded by introducing Mr Bell to the meeting.

The Chairman, addressing Mr Bell, said he had been invited to attend this meeting of the Highland and Agricultural Society of Scotland in order that they might mark in this public manner the high esteem they entertained for his services to agriculture by the invention of "Bell's Reaping-Machine," the parent from which all the others had sprung, and which had been worked with so much success at Mr Bell's late brother's farm of Inchmichael, as well as in many other places in Scotland. He (the Chairman) believed he was speaking the universal opinion of farmers when he said that the reaping-machine came to their relief at a time when manual labour was very scarce in all parts of the United Kingdom, and that the machine was most effective and was most usefully used on many farms in the present day both in Scotland and England. His own experience taught him that Mr Bell had received the universal blessing of farm labourers, old and young, as he had saved their backs from the dreadful torment they used to suffer when stooping to reap the crops of corn with the sickle. At the same time, he had disgusted very much the sportsmen of the country, who find now, instead of the long stubble, that the corn was cut so short that it would scarcely conceal a sparrow. (Laughter.) On the other hand, it worked very much to the delight of those who felt an interest in a luxuriant crop of turnips, which an abundant crop of straw generally produced. Although the public acknowledgment of Mr Bell's services as the original inventor of the reaping-machine had been long delayed, his Lordship trusted that the public manner in which the compliment was now paid would be not only satisfactory to himself but to his family. As Chairman of this meeting, he congratulated Mr Bell on the success of his invention, and presented him, in name of those who were reaping its benefits, their gratitude, and also a lasting testimonial of the value that they put upon his services, not only to this country, but to other portions of the world. There was one point he would mention, which he was sure Mr Bell, as a minister of the gospel, would be gratified to hear—namely, that he had been instrumental in reducing the amount of immorality which was wont to prevail, as this invention had done away with the necessity of having fifty or a hundred people, young and old, in barns or all sorts of buildings and farm offices ; and no person could answer for the amount of immorality that took place. There seemed to be a very unanimous opinion as to the value of Mr Bell's services. The subscription had not reached the amount required—it was still L.30 short of L.1000 ; but he felt so grateful for the invention that he would himself be most happy to make up that sum.

Mr Bell, on returning thanks to the Society, said—My Lord Marquis and Gentlemen,—Although I cannot say that I am unaccustomed to public speaking, the addresses that I am called upon to make weekly are of a very different kind from that which may be expected of me this day, and I really do not know what words I can use to express my feelings on this occasion, the proudest day in my life. I have especially to thank the committee for

the trouble they have had in the matter. I have no doubt they have had a great deal of anxiety, and no little exertion, before they were able to bring their scheme to so favourable a termination on my account; but so far as I understand, they undertook the work, and finished it cheerfully. I have likewise to thank the subscribers generally for the handsome testimonial which the Chairman has now presented to me. My feelings are very different this day from what they were forty years ago—when I left my father's house on a cold winter morning, took my seat upon the top of the Edinburgh coach—(there were no railways in those days)—wended my way to the capital of Scotland, for the purpose of making my first bow before this honourable Society. On that occasion I was full of fears and trembling—afraid that my invention should turn out a mere chimera, and trembling when I thought of coming before learned and scientific men. I had a small wooden model of the machine under my arm, which looked like anything rather than a design for cutting corn. As my friends advised me before I started, I waited upon the Secretary of the Society, the late Sir Charles Gordon, to hear what he would say about it. Sir Charles looked over it, and after examining it attentively, declared he was no mechanic, and, consequently, could give no opinion upon the matter, but added, he would be glad to give me an introduction to a celebrated mechanic who lived in the town—he alluded to the late Sir John Graham Dalyell, a well-known and much respected gentlemen in his day. He accordingly gave me an introduction to Sir John, and I went to his house and showed and explained the model to him, which looked liker a rat-trap than anything else I know of. Sir John looked at it, and said that it was a very difficult thing to give a decided opinion upon the model of any contrivance that would be able to cut a standing crop of corn in an efficient manner; but, so far as he was able to judge, the model looked like a thing that would do so, and he recommended me to get a machine constructed upon the large scale after the pattern of my model, and try it next harvest. This was the first encouragement to prosecute the idea I had formed that I had received. The horizon of my imaginings grew brighter, and I was able to speak, even to Sir John, in more confident terms. When I got home, a large machine was immediately set about being constructed; it was finished before harvest, started amongst the standing corn before it was ripe, and it worked very well, and I was obliged to Sir John for the friendly advice he gave me. Had he condemned the principle, it might never have gone a step further. You are all as well acquainted with the machine as I am, so that it is quite unnecessary for me to take up the time of the Society by continuing its history. Sir John Graham Dalyell gave it the first push, and you, to-day, have put on the capstone. I can only again thank you for the distinguished honour you have this day done me.

The meeting then separated.

[A small model of the Reaping Machine made by Mr Bell many years ago was exhibited on the table.]

PROCEEDINGS AT BOARD MEETINGS.

MEETING OF DIRECTORS, 6TH FEBRUARY 1867.

Mr DUDGEON of Cargen in the Chair.

CHAIR OF AGRICULTURE.—The Secretary reported a correspondence with the Treasury regarding the endowment of the Chair of Agriculture, which is now under their Lordships' consideration.

VETERINARY COLLEGE.—Tuesday and Wednesday, the 16th and 17th April, were fixed as the days for examining the students of the Edinburgh Veterinary College for the Society's certificate.

AGRICULTURAL EDUCATION.—The days of examination of candidates for the Society's agricultural certificate and diploma were reported to be the 12th and 13th March, candidates being required to lodge intimation on or before the 1st of that month.

TESTIMONIAL TO REV. PATRICK BELL.—The Secretary reported that the committee in charge of the testimonial to the Rev. Patrick Bell had held a meeting that forenoon, when the form of the circulars to be sent to the members of the Society, and of the Chamber of Agriculture and others, had been approved of; and that the subscriptions already intimated amounted to above L.160.

GLASGOW SHOW.—A vote of L.200 by the Town Council of Glasgow, in aid of the Show, to be held there on the 30th and 31st July and 1st August next, was reported. It was also intimated that the Magistrates had agreed to give the Society the use of the Green for the purposes of a showyard, and had resolved that no cattle should be permitted on the Green previous to the Show. A proof of the premium sheet and regulations was submitted and approved of; and it was stated that the railway companies in Scotland had agreed to give the usual free return to unsold stock and implements sent to the Show.

PLOUGHING COMPETITIONS.—Returns of forty-nine ploughing competitions held in different districts of Scotland were reported, and the issue of a silver medal to the winner of the first premium at each was authorised.

DUTCH HAY.—It was unanimously resolved that another representation should be made to the Privy Council on the subject of the importation of Dutch hay, great danger being apprehended from the quantity now being introduced for the use of horses and for packing purposes.

MEETING OF DIRECTORS, 6TH MARCH 1867.

Mr DUDGEON of Cargen in the Chair.

"TRANSACTIONS" FOR 1867.—The *Transactions* for 1867, including the premium book and list of members, were laid on the table, and the Secretary stated that the publishers were in course of issuing copies to those members who had made application to receive them.

CULTIVATION BY STEAM.—The Secretary stated that the committee appointed to report on cultivation by steam had held a meeting on the 20th February, when it was resolved that the report should embrace the results of two seasons, and that it should also contain information as to the expense of ordinary horse ploughing. It was further reported that the chairman of the committee (the Marquis of Tweeddale) had undertaken to prepare a set of queries to be put to farmers regarding the general expense of horse ploughing, and the names of several gentlemen were suggested as suitable parties for giving information on the subject.

Veterinary College.—A letter from the Duke of Buccleuch, with reference to a veterinary charter for Scotland, was read; and on the motion of Mr Walker of Bowland, Mr Gillon of Wallhouse was unanimously appointed to the office of chairman of the Standing Committee on the Veterinary College, in room of Professor Goodsir.

Agricultural Education.—It was reported that six candidates had intimated their intention of presenting themselves for examination for the Society's agricultural certificate and diploma, and that the written examination papers were in course of being prepared by the Board of Examiners on the Science and Practice of Agriculture, Botany, Chemistry, and the other branches named in the bye-laws.

Glasgow Show.—The Secretary mentioned that he had visited Glasgow on the 4th March, along with the Society's Master of Works, for the purpose of selecting a site for the showyard. Mr Monro, the town clerk, and other officials, were present, and gave every assistance, and approved of the portion of the Green chosen. The revisal of showyard specification, certificates of entry, and contract for refreshments in the yard, &c., was remitted to the Committee on General Shows.

Edinburgh Christmas Club.—A letter was read from the Secretary of the Edinburgh Christmas Club, transmitting their rules, and requesting the patronage and support of the Society. A communication from Mr Geddes, Orbliston, supporting the application, was also read; and the Directors remitted the subject to the Committee on District Shows.

Proposed Show at Dundee.—A letter from Lord Kinnaird, with reference to an Agricultural Show to be held at Dundee during the meeting of the British Association in September next, was read. His Lordship mentioned that he was endeavouring to arrange that it should take place under the united auspices of the Perth, Fife, Kinross, and Clackmannan Society and the Angus Association, and requested the assistance of the Society in the way of premiums for stock, &c. The Secretary was instructed to communicate with his Lordship and these associations, and report to the Committee on District Shows.

Transit of Cattle by Rail, &c.—A pamphlet by Mr Reid, Granton, entitled "The Story of of the Truck," sent by the author to the Society, was laid on the table, and after considerable discussion the subject of the transit of cattle by rail, sea, &c., was, on the motion of Mr Heddle of Melsetter, remitted to a special committee, of which Mr Dudgeon of Cargen was named convener.

Testimonial to Patrick Bell.—It was reported that subscriptions to the testimonial to the Rev. Patrick Bell had been intimated to the amount of L.570, and that the sum received was L.474. The Secretary regretted that the subscriptions were not progessing so well as he could wish, but that as it had been decided to send subscription-lists to all the bank agents in Scotland, he hoped the result would be satisfactory.

Potato-Lifter.—A communication from Mr James Gibson, on behalf of the potato merchants of Glasgow and the west of Scotland, requesting the assistance of the Society in offering a premium for an improved potato-lifter, was remitted to the Committee on the Glasgow Show.

MEETING OF DIRECTORS, 3d APRIL 1867.

Lord Belhaven and Hamilton, K.T., Vice-President, in the Chair.

Agricultural Education.—The Secretary reported that the examinations for the Society's agricultural certificate and diploma had been held on the 11th, 12th, and 13th March, when the following gentlemen passed the necessary examinations:—*For Certificate and Diploma.*—1. Robert Brydon, Burncastle, Berwickshire; 2. George Kent Walton, Long Compton, Warwickshire. *For Certificate.*—1. James Cooper Bowstead, of Halkthorpe Hall, Penrith; 2. Thomas John Elliot, Wilton, Salisbury; and a letter was read from Professor Wilson, announcing that the prizes of L.6 and L.4 annually allowed by the Society to the students who pass the best and second best examinations in the Agricultural Class in the University of Edinburgh, had this year been awarded to—1. Richard George Scriven, Northamptonshire; 2. Robert Brydon, Burncastle, Berwickshire. The prizes had, as usual, been given in books.

Veterinary College.—It was reported that at a meeting of the Veterinary Committee, on the 27th ult., the examiners had been appointed, and other preliminary arrangements had been made for the examination of the students at the College Hall on the 16th and 17th current, between the hours of eleven and four. On the recommendation of the committee, the Directors unanimously resolved to give silver medals as formerly to those who pass the best examination on anatomy, physiology, chemistry, materia medica, cattle pathology, horse pathology, and best general examination.

Glasgow Show, 1867.—The specification for the different fittings in connection with the Glasgow Show, together with the plan of the ground, and drawings of the various erections, which had been before the General Show Committee on the 27th of March, were laid on the table. The Board approved of the same, and authorised the Secretary to intimate to intending contractors that the specification and relative plans would be seen at the Society's chambers in Edinburgh; or on application to the Local Secretaries, Messrs M'Cowan and Brown, 87 St Vincent Street, Glasgow, between the 12th and 22d curt. The usual letter addressed to the conveners in reference to the nomination of the Committee of Superintendence was submitted, and the number from the different counties was fixed as follows:—Lanark, 16; Renfrew, Argyll, and Ayr, 10 each; Bute, 6—in all, 52; besides the lords-lieutenant, vice-lieutenants, conveners, and members of Parliament who *ex officio* belong to the committee.

Aberdeen Show, 1868.—Letters to the conveners of the counties connected with the Aberdeen Show (Aberdeen, Banff, Kincardine, and eastern division of Forfar), in reference to the auxiliary subscription, were submitted and approved of.

District Shows.—A grant for this year was allowed to the Edinburgh Christmas Club to the amount of L.50, to be offered in the form of special prizes to be named by the Club and approved of by the Directors of the Highland Society. The Secretary having brought under the notice of the meeting that the district of Formartine, in Aberdeenshire, was entitled to the Society's cattle premiums in 1868, the Directors resolved that they should be allowed to be competed for this year, as all local shows in 1868 are in abeyance in Aberdeenshire on account of the General Show being held there that year.

Grass Seeds from British Columbia.—The Secretary reported that in the spring of 1866 the Society had received three communications from Mr W. E. Cormack, New Westminster, British Columbia, transmitting four samples of grass seeds indigenous to that district. In the first letter, Mr Cormack says:—

"I beg to forward to you a little of the seed of the inestimable bunch grass of British Columbia, celebrated on account of its nutritious qualities for strengthening and fattening horses and horned cattle, and which, if introduced

into some of the Highland districts of Scotland, might prove a valuable acquisition. It grows only in the interior, not at the sea coast; and in those inland districts where artificial provender is not yet produced in any quantity, horses, mules, and horned cattle gain strength and thrive upon it better than upon any artificially grown food. The small quantity now sent in a letter is merely a forerunner of more, which I mean to send to you by some other mode of conveyance than by post.

"The first object is to ascertain if it will grow in Scotland. It thrives better upon moist soil than upon dry. Its history has been little attended to, and what is known of it is from the experience of transient equestrian travellers and cattle dealers, who supply the miners in the districts with meat. There are several varieties of it in different districts, all equally valuable. It grows in large bunches, about one and a half to two feet in height, standing a foot or two feet apart. When eaten down by cattle it is said not to grow again from the same roots, wild sage taking its place. It is a question if it produces seed every year; and the seed may require two years to germinate. The seed will likely enable you to give it a botanical place."

The second communication, dated 8th February 1866, is as follows :—

"On the 18th December last, I had the pleasure of addressing you, transmitting a preliminary sample of the seed of a very valuable grass, called the bunch grass, indigenous to the elevated interior parts of British Columbia, and along the range of the Rocky Mountains, in the hope that upon trial such a grass might prove valuable in the Highlands of Scotland. I have now the pleasure of sending an additional sample."

Mr Cormack gives the following particulars concerning this plant, which had been supplied to him by an observant traveller in the interior :—"The nutritious qualities of the bunch grass of British Columbia are really surprising. It grows in very poor sandy, gravelly soil, and at very high altitudes, even several thousand feet above the level of the sea, and seems to grow well in places where there is little or no other vegetation. All kinds of live stock fatten very rapidly on bunch grass; and the packers in this country burn off the old dry grass in the fall of the year, so that they may have a fresh supply of young grass for their horses and mules in the spring. It makes very good hay, and when perfectly dry loses none of its nutritious qualities."

With the third letter from Mr Cormack, the Society received three other species of indigenous grasses from Lake la Hache, near the Cariboo district, as well as the following particulars concerning them :—

"No. 1. Found on comparatively low ground; height, 3 feet to 3 feet 6 inches. No. 2. A Timothy, on low, loamy soil and marshes; height, 6 feet to 6 feet 6 inches. No. 3. Red top, found on comparatively low ground and marshes; height, 3 feet 3 inches to 3 feet 6 inches. The red top is allowed by graziers and travellers to be equally valuable with the bunch grass; and the other two sorts, Nos. 1 and 2, are evidently well worth a trial."

Under the instructions of the Directors, the late Secretary lost no time in placing the seeds, along with the explanatory notes, in the hands of two eminent nurserymen of Edinburgh (Messrs Robert T. Mackintosh and Peter S. Robertson), who kindly undertook to prove the seeds; and the reports of these gentlemen have just been received.

Mr Mackintosh's statement is as follows :—"Referring to the grasses that were sent to me by the late Mr Hall Maxwell to prove and report upon, I beg to say that I sowed said seeds, and watched their growth very narrowly. I have to inform you, however, that out of the four samples sent me only two vegetated—No. 1 and No. 4—and which are quite up to the description that accompanied them. No. 1, in my opinion, is too much allied to the bent grasses of our country to be any great acquisition to our already numerous family of grasses. No. 4 I think differently of, from its appearance and succulent nature; growing on poor soils in high situations, it might prove a very valuable

addition to the Italian grass family, which, in appearance, it very much resembles, with this in its favour over the Italian of evidently being much hardier."

Mr Robertson's report is in the following terms :—"In reply to your favour of this date (30th March), regarding the Columbian grass seeds which I received from the late Mr Hall Maxwell, I had them all sown on carefully prepared ground in April 1866, and the following is the result :—1st, Grass from Lake la Hache came up pretty well, produced broad, short, soft leaves in abundance, came into flower in August, appeared to be a species of Bromus ; the panicles grew to a height of 1 to 1½ feet, but had no fertile seeds. The plants had no covering during last winter, and they are looking very fresh and healthy at present. I notice that the growth made by the leaves at this date is far earlier than our ordinary grasses, and looks as if it would be nearly as early as *Bromus Schraderii*. I intend to separate the stools during April to increase the plants, and to see if the second year's herbage be stronger than the first year's. 2d, Timothy grass, from same lake as above—only three or four plants of this parcel grew ; these did not flower last year, are at present quite healthy, and resemble the common Timothy in every respect, but that they are growing much earlier. I purpose to divide the plants of this also, and as it belongs to a more promising family than the Bromii as a forage grass, I have a hope it may be worth attention. 3d, Fescue Grass.—Grew well, leaves long, very narrow, is distinct from any of the cultivated sorts, the herbage scanty, no flowers produced, and about half of the plants killed during the winter. I suspect this parcel contained two species. The seeds did not look different, but the result as to hardiness seems to indicate a mixture. Of the other parcels none grew with me, and I fear that no further germination can be expected this year."

Native Sheep of British Columbia.—Mr Cormack added, in his letter of the 8th February 1866, that he had been endeavouring to obtain a living lamb or two of the native sheep of British Columbia to send to the Society, with the view of experimenting for the improvement of the wool or carcass, or both, of some of the breeds of Great Britain ; and if he was fortunate enough, he was to devise some means of sending them to Edinburgh ; but from a letter recently received (dated 20th November 1866), it appears he did not succeed in procuring any. He promises, however, to spread his endeavours next spring to more localities where these animals are met with, when he hopes for better success. The nearest mountains to New Westminster for the sheep lie about one hundred miles to the eastward. Mr Cormack states that the mutton of these wild sheep is admitted by all who have partaken of it to be superior to any in Europe; while the fleece or hair is very coarse, somewhat similar to that of the rein or other deer, and of a brown-grey colour.

The California Quail.—Mr Cormack further mentions in his last letter that the California quail has of recent years been successfully introduced into British Columbia, and offers to send specimens to the Society. It is stated to be a hardy, handsome, and good-sized bird. It is first placed with domestic poultry (with which it agrees and feeds, and breeds from choice) outside of the yard, and then soon spreads over the country. In British Columbia, even in districts covered almost entirely with dense pine forests, where the winter is as long and severe as in Scotland, it thrives seemingly as well as in parts of California, where forest trees are widely scattered, and under an almost perpetual summer. The birds propagate very fast, and would seem to breed in California throughout nearly the year. They are esteemed the most delicate bird there for the table. They like to harbour near the habitation of man, as if for security against beasts of prey, which devour them in immense quantities. They will lay eggs though deprived of their liberty, but will not hatch them in confinement.

The Secretary was instructed to thank Mr Cormack for the interest he had taken in procuring seeds, &c., for the Society.

MEETING OF DIRECTORS, 1st MAY 1867.

Lord Belhaven and Hamilton, K.T., Vice-President, in the Chair.

General Meeting.—The Half-yearly General Meeting of the Society was fixed to be held on Wednesday the 19th of June, being the week after the closing of the entries for the Glasgow Show.

Glasgow Show.—Tenders for enclosing and fitting up the showyard to be erected on Glasgow Green were reported from eight builders, three belonging to Edinburgh and five to Glasgow. The estimate by Messrs John Watherston & Sons, Edinburgh, was accepted, being L.180 less than the lowest Edinburgh offer, and L.90 under the lowest from Glasgow. It was resolved that the head-quarters of the Society, when in Glasgow on the occasion of the Show, should, as in 1850 and 1857, be at the Queen's Hotel. The arrangements as to the public banquet, refreshments in the yard, and provender for stock, were remitted to the Committee on General Shows. On the motion of Mr Geddes, Orbliston, seconded by Mr Heddle of Melsetter, it was agreed that sleeping accommodation, as at Inverness, should be supplied within the Glasgow showyard for the men in charge of stock, exhibitors who are desirous of availing themselves of such accommodation being required, when making their entries, to specify the number of men for whom it is required.

Veterinary College.—After the report of the examination for the Society's veterinary certificate had been submitted, a correspondence was read in reference to obtaining a veterinary charter for Scotland; and it was remitted to the Society's Veterinary Committee to draw up a memorial to the Privy Council on the subject. The Secretary having stated that Professor Hallen had resigned his appointment as Professor of Veterinary Surgery to the Society, in consequence of his being required to return to his duties under his commission in Her Majesty's Indian Service, the following resolution was unanimously adopted:—"The Board cannot accept Professor's Hallen's resignation of the appointment of Professor of Veterinary Surgery to the Highland and Agricultural Society without recording in their minutes its sense of the value of his services as Professor of Veterinary Surgery in the Edinburgh Veterinary College, and the great regret with which his resignation of that office has been received."

The following letter, from Mr Gillon of Wallhouse to the Secretary of the Jockey Club, London, in reference to a recent rule of the Club, was read:—

"Wallhouse, Bathgate, April 29, 1867.

"Sir,—As chairman of the Veterinary Committee of the Highland and Agricultural Society of Scotland, I beg to call your attention to No. 15 of the Jockey Club Rules, regarding certificates for foreign horses—'to be signed by a veterinary surgeon being a member of the Royal College of Veterinary Surgeons'—and to request your consideration whether it would not be desirable to add thereafter, 'or holder of the Highland and Agricultural Society's diploma'—such graduates for many years past having been eligible for the army, as well as for all civil appointments.—I am, Sir, your most obedient servant, (Signed) "A. Gillon."

Argyll Naval Fund.—On the recommendation of the Committee in charge of Argyll Naval Fund, of which Admiral Sir William J. Hope Johnstone, K.C.B., is chairman, a fifth naval cadet (Mr George Pirie, R.N., a native of the island of Mull) was added to the list of recipients.

The fund was instituted in 1806 by the donation of L.1000 from the late John, fifth Duke of Argyll (the original President of the Highland Society), for the purpose of assisting in the maintenance and education of the sons of Highland gentlemen destined for the royal navy. The donation was allowed to accumulate till 1826, when it amounted to L.2314, and, under the prudent

control of the finance and other committees of the Society, a sum of L.2700 has, during the last forty years, been expended on naval students. The fund now amounts to above L.5200, invested in heritable and other securities, and the revenue is fully capable of meeting five allowances of L.40.

Field Experiments.—At a meeting of the Committee on Field Experiments held yesterday, it was arranged, and subsequently sanctioned by the Directors, that the experiments for season 1867 should be similar to those made in 1866, which are fully described in the last number of the "Society's Transactions." The details to be carried out by Dr Anderson and a subcommittee.

Edinburgh Christmas Club.—Permission was given to the committee in charge of the Edinburgh Christmas Club to hold the first general meeting of the Club in the Society's Hall, on Wednesday the 5th of June.

Testimonial to Rev. Patrick Bell.—The Secretary reported that the subscriptions received to the testimonial to the Rev. Patrick Bell for his services in connection with the reaping-machine, amounted to L.709, 19s. 6d., and that several additional sums had been intimated. As there are subscription papers at all the banks in Scotland, and returns are to be received by the beginning of June from the several agencies, it is expected that the additional sum obtained through this channel will raise the subscriptions considerably.

MEETING OF DIRECTORS, 5th JUNE 1867.

Mr Dudgeon of Cargen in the Chair.

Glasgow Show.—The committees named by the counties of Lanark, Ayr, Argyll, Renfrew, Bute, and Arran were submitted, and a large deputation of Directors was appointed to be present at the Show on the 30th and 31st July and 1st August. Wednesday next being the last day for taking in entries, the Secretary reported that he would attend at the Queen's Hotel, Glasgow, on the 11th and 12th curt., to receive certificates and to close the list; and that a meeting of the General Committee would be held there on Wednesday the 12th curt., at two o'clock.

Professor of Veterinary Surgery.—On the recommendation of the Society's Veterinary Committee, Mr W. Williams, of Bradford—who was recently elected Principal of the Dick College, Edinburgh—was unanimously appointed Professor of Veterinary Surgery to the Society. Mr Williams is a graduate of the Edinburgh Veterinary College, and holds the Society's veterinary certificate or diploma. The other business transacted had chiefly reference to the arrangements for the general meeting of the Society on the 19th, the proposed royal veterinary charter for Scotland, the printing of the Society's Transactions, and the awards for reports in competition for premiums.

MEETING OF DIRECTORS, 19th JUNE 1867.

The Duke of Buccleuch, President of the Society, in the Chair.

Transaction of business preparatory to the general meeting of this date.

MEETING OF DIRECTORS, 3d JULY 1867.

Mr Gray, Southfield, in the Chair.

The business had reference to Chair of Cattle Pathology, Veterinary Charter, and Estimates for Printing the Society's Transactions, when the offer by Messrs Neill & Company was accepted.

MEETING OF DIRECTORS, 21st AUGUST 1867.

Mr Gillon of Wallhouse in the Chair.

The business had reference to the Glasgow Show, Chair of Cattle Pathology, and Selection of Reports for Publication.

MEETING OF DIRECTORS, 9th OCTOBER 1867.

Mr Gray, Southfield, in the Chair.

The business had reference to the Chair of Cattle Pathology, Veterinary Charter for Scotland, and Aberdeen and Edinburgh Shows.

MEETING OF DIRECTORS, 6th NOVEMBER 1867.

Mr Dudgeon of Cargen in the Chair.

Aberdeen Show, 1868.—Money premiums to the amount of about L.1300 were allocated to the different classes of stock, which have been for some time before the public; and it was resolved that the third prize in all these classes should be the medium silver, in place of the bronze medal, which has been in existence since 1857. In the poultry class, 65 silver and 65 bronze medals were recommended. At the request of the Aberdeen district, 50 sovereigns were appropriated as a special prize for the best thoroughbred entire horse. The days of the Show were suggested to be the 28th, 29th, and 30th July.

Proposed Show at Edinburgh in 1869.—A requisition for a Show to be held at Edinburgh in 1869, signed by a number of members of the Society, was submitted to the meeting of the Board on the 9th of October, when the Directors resolved to recommend to the next general meeting to comply with the request, and remitted to the Committee on General Shows to suggest the classes of stock for which premiums will be afterwards offered. At a meeting of the committee, held to-day, the classes were named and subsequently approved of by the Directors, the list to be submitted to a meeting of members in the district of the proposed Show—namely, the counties of Edinburgh, Haddington, and Linlithgow.

Veterinary College.—The opening of the session 1867-68, on the 30th of October, by an inaugural address from Professor Williams, and the induction of Mr MacBride to the new Chair of Cattle Pathology, which took place the same day, were reported.

Office-Bearers for 1868.—It was remitted to the Committee on Office-bearers to report on the vacancies which occur at the next general meeting in January.

Premium Book for 1868.—It was likewise remitted to the Committee on Premiums for Subjects connected with the Science and Practice of Agriculture, and on Woods and Plantations, to revise the lists for next year.

District Shows.—The various reports of local competitions which have taken place during the current year in almost every county in Scotland were referred to the committee in charge of that department; and, at the same time, to consider the applications for new grants for 1868.

Papers in Competition.—A list of the reports received in competition for premiums offered in 1867 was laid on the table, and committees were named to read and report on their merits.

Cultivation by Steam-Power.—Copies of queries to be answered by farmers as to the cultivation of land by horse-power, which have been exten-

sively circulated in Scotland, were laid on the table. The answers are to be returned before the 31st of December, and will form part of the report on steam cultivation, which has been for some time in charge of a special committee of the Society.

MEETING OF DIRECTORS, 22d NOVEMBER 1867.

Mr Dudgeon of Cargen in the Chair.

The business had relation to appointment of Deputation to wait on the President of the Board of Trade, on 26th November, in regard to the Veterinary Charter for Scotland.

MEETING OF DIRECTORS, 4th DECEMBER 1867.

The Duke of Buccleuch and Queensberry, K.G., President of the Society, and afterwards Mr Dudgeon of Cargen, in the Chair.

Veterinary Charter for Scotland.—Mr Campbell Swinton of Kimmerghame reported the proceedings of the deputation which waited on his Grace the Duke of Richmond, President of the Board of Trade, on the 26th November, on the subject of a veterinary charter for Scotland, the substance of which has already appeared in the newspapers.

General Meeting.—The next half-yearly general meeting of the Society was fixed, in terms of the charter, for the 15th of January, and the programme of business to come before the Society was arranged and approved of.

Office-Bearers for 1868.—The report of the committee appointed to suggest names to fill the vacancies which occur at the general meeting was given in, and the Secretary was instructed to communicate with the noblemen and gentlemen proposed before publishing their names.

Endowment of the Chair of Agriculture.—A deputation from the Senatus Academicus of the University of Edinburgh, consisting of Dr Lyon Playfair, C.B., Dr Christison, and Dr Balfour, waited on the Directors in regard to the endowment of the Chair of Agriculture in the University; and, after a lengthened conversation, consideration of the subject was, on the motion of Mr Irvine of Drum, remitted to the following committee:—Mr Campbell Swinton, convener; Dr Playfair, Dr Balfour, Mr Dudgeon of Cargen, Mr Newton of Castlandhill, Mr Russell, Pilmuir, and Mr Hope, Fenton Barns.

Premium Book for 1868.—Certain subjects for which premiums had been offered in the list for 1867 were deleted, approved papers having been received. Amongst the new subjects are:—Reports—On the agriculture of East Lothian; on the duties of the veterinary surgeon in the examination of horses as to soundness; on pleuro-pneumonia—its reported disappearance during the restrictions on the movement of cattle—its reappearance when the restrictions were removed—and the best method to be adopted for its eradication; on disinfecting agents, especially of sulphurous acid and carbolic acid for preventing attacks of cattle plague and pleuro-pneumonia, or in extiripating the diseases when they have appeared; and on the profitable extension of the poultry department in a mixed farm in Scotland.

District Competitions.—The report of the committee was given in, and bears that next year competitions will take place in thirty-one districts for cattle, horses, sheep, swine, and dairy produce; and that about 180 silver medals will be given to local associations in various parts of the country for stock, seeds, roots, best kept cottages and gardens, &c.

Aberdeen Show, 1868.—The Secretary reported having attended a meeting at Aberdeen on the 29th November, when the premium list, as printed, had been approved of, except in reference to the services of the first prize

thoroughbred horse, the members in the Aberdeen district being of opinion that the owner should be bound to travel the horse through the season, or the following season, in the district. He read a letter from Major Ramsay of Barra, begging of the Directors to reverse their decision; and there was laid on the table a memorial from members in Aberdeenshire, stating "that with a view to meet the difficulty that the L.50 prize alone does not form a sufficient inducement, the committee proposed that an equal sum be raised in the district by subscription, making the prize up to L.100—on the understanding that the Directors consented to annex the condition stated to the prize." The Secretary stated that a very strong feeling had been exhibited at Aberdeen on the subject, and after some discussion, in the course of which Mr Irvine of Drum urged on the Directors to agree to the memorial, it was moved by Mr Dudgeon, seconded by Mr Heddle of Melsetter, and unanimously agreed, to acquiesce in the prayer of the memorial, and to attach a condition to the premium that the horse shall be bound to serve in the district.

Mr Irvine of Drum, convener of the county of Aberdeen, was named chairman of committee of superintendence for the show.

Edinburgh Show, 1869.—It was reported that a meeting of members connected with the district of the Show proposed to be held at Edinburgh in 1869 had been held on the 27th of last month, when the list of classes of stock had been adjusted. The additions then made in the class of extra horses were sanctioned by the Board yesterday; and on the suggestion of Mr Kinloch, yr. of Gilmerton, a section for three-year old mares or geldings, suitable for field, was added. The list, as amended, will be submitted to the next general meeting for final approval.

Finance.—A statement of the funds at the close of the financial year on the 30th November was submitted, and it was mentioned that an abstract of the income and expenditure would, as usual, be published next month, after being prepared by Mr Kenneth Mackenzie, C.A., the Society's auditor, who is now in possession of the accounts.

Argyll Naval Fund.—Admiral Sir William J. Hope Johnstone, K.C.B., chairman of the Standing Committee on the Argyll Naval Fund, submitted a printed statement containing remarks on the origin and management of the fund, which he had drawn up for the information of members of the Society. On the motion of Mr Dudgeon of Cargen, a vote of thanks was given to Sir William Hope Johnstone, to whom, he said, the good management of the fund was in a great measure due.

Miscellaneous Communications.—Letters from Mr Johnston, Rockmount, Newton-Stewart, Ireland, on the cause and cure of finger-and-toe in turnips, and from Mr Mason of Meadowbank, Edinburgh, on experiments with sewage manure, were laid on the table.

Testimonial to Rev. Patrick Bell.—The Secretary stated that the presentation of the testimonial to the Rev. Patrick Bell, the inventor of the reaping-machine, would take place at the general meeting of the Society on the 15th of January. The sum received amounted to L.929, 17s., but the committee in charge of the testimonial hoped that it would be considerably increased before the meeting.

MEETING OF DIRECTORS, 8th JANUARY 1868.

Mr Dudgeon of Cargen in the Chair.

Death of the Right Hon. Sir George Clerk, Bart., Honorary Secretary of the Society.—Before proceeding to the business of the day, the Directors resolved, on the motion of the Chairman, to record in their minutes the deep regret with which they regard the death of the Right Hon.

Sir George Clerk of Penicuik, Bart., and to express their sense of the valuable assistance which the Society had for many years received from him as Honorary Secretary, and as a member of the Council on Agricultural Education.

General Meeting.—The business to come before the Society at the half-yearly general meeting, on the 15th current, was arranged as follows:—1. Office-bearers to be elected; 2. Election of members; 3. Accounts for 1866-67; 4. Bye-law as to execution of deeds; 5. Glasgow Show (1867)—Votes of thanks to Local Authorities; 6. Arrangements in regard to Aberdeen Show (1868); 7. Requisition from Edinburgh district for Show in 1869; 8. District Shows; 9. Report of Special Committee on Endowment of Chair of Agriculture; 10. Proceedings in regard to Veterinary Charter; 11. Dr Anderson's Report on the Chemical Department; 12. Premiums awarded for Essays and Report; 13. Contents of No. 3 (fourth series) of the Transactions.

Testimonial to Rev. Patrick Bell.—It was reported that at a meeting of the committee, held yesterday, it had been resolved that the testimonial to the Rev. Patrick Bell should be presented after the general meeting on the 15th curt.

Veterinary Charter.—The Secretary reported that he had summoned the Veterinary Committee on the 20th of December to meet, in conjunction with the Town Council Veterinary Committee, a deputation of veterinary surgeons, and he read to the Board the minute showing that a largely increased representation had been granted to veterinarians in the constitution of the proposed college. The minute was approved of.

Chair of Agriculture.—The report by the Special Committee, appointed on the 4th of December to consider the endowment of the Chair of Agriculture in the Edinburgh University, was read and accepted, but remitted to Drs Playfair and Balfour for additional explanation previous to being brought before the next meeting of Directors and the general meeting of the Society.

Finance.—Mr Kenneth Mackenzie, C.A., the Society's auditor, submitted abstracts of the accounts for 1866-67, together with a state of the funds at 30th November last, signed by himself and two members of the Finance Committee. The detailed accounts will be laid before the general meeting on Wednesday next, along with printed abstracts.

Essays and Reports.—On the recommendation of the Reading Committee, premiums were awarded for various reports, which will be announced at the general meeting.

Drainage by means of a Siphon.

A communication from Mons. Cretin Borne, dated 39 Devon Street, Eglinton Street, Glasgow, December 1867, of which the following is a translation, was submitted:—

"Being possessor of a new system of draining, I take the liberty of communicating it to you, and if it can be employed with advantage in the interest of agriculture as well as health, I shall be happy to see it adopted.

"This method consists of an intermittent siphon, made of pipes of such dimensions as may be required, of metal, wood, or by preference glazed earthenware, as less expensive and more desirable. The pipes should be laid in the following manner:—

"1. The pipes should be placed at a certain depth in the ground so as not to be affected by frost; they may follow the variations of the level of the land, provided, however, that the highest part does not rise higher than from 28 to 30 feet above the level of the water in the basins.

"2. There should be a receiving or catch-water basin of stone, brick, or wood, the bottom of which should be 3 feet below the level of the lowest part of the ground to be drained, and into which the water will arrive by trenches slightly inclined cut in the ground. One of the extremities of the siphon should be immersed in that basin at the height of a foot above the bottom.

"3. A second basin, like the first, and fixed at the same level, should be constructed at the outlet of the siphon, that outlet being at the place thought most suitable for the discharge of the water, whatever may be the distance to be traversed; this basin we will call the outlet basin. The outlet of the siphon or main pipe should there be fixed, and immersed at the same level as its inlet at the receiving basin. There will be in the upper part of this outlet basin an opening some inches in depth of a size calculated and proportioned to the quantity of water which it will have to discharge.

"4. At the highest part of the siphon or pipe there will be a branch of some inches in length, fitted with a strong cock, to which there may be connected a suction pump for making a vacuum in the pipes once for all.

"5. The end of the siphon fixed in the outlet basin, before making the vacuum, should be tightly and hermetically closed, so as to prevent the air getting in. The vacuum having been once obtained, the pump will begin to draw water, and then the cock should be shut immediately, and the pump carried away for good.

"We must then go to the outlet basin, open the pipe, and the water will instantly begin to flow. The flow of water will only cease when the land drains shall cease to supply the receiving basin. The flow having ceased, the two basins will remain filled with water at the same level, and the main pipe forming the siphon will remain full of stagnant water by the effect of the atmospheric pressure exercised equally upon the water of the two basins. The water will not again begin to flow of itself except when, in consequence of rain, the drains begin to supply water to the receiving basin, so as to raise the level of the water in it. The two basins should be surrounded by walls, and covered so as to prevent the walls freezing in the winter, and furnished with a grating to protect it from all mishaps. The branch pipe at the summit of the siphon should be equally secured from any unforeseen accident. I do not think I need give more ample details. If you would like to try the experiment, which can take place in any locality, I shall be very glad to place myself at your orders, provided you give me two days' notice, so as to prepare. The expense of that would not exceed five guineas. The experiment would be made with cubes of lead arranged with boxes for basins."

The Secretary stated that he had placed Mons. Borne's letter in the hands of Professor Macquorn Rankine, who had transmitted the following report:—

"Remarks on Mons. Cretin Borne's proposed method of drainage by means of a Siphon.

"1. There can be no doubt that cases frequently occur in which the method of drainage proposed by M. Cretin Borne, by means of a siphon pipe, would be very useful. It is certain also that the method is quite practicable, and that there would be no serious difficulties in carrying it into effect.

"2. It must be observed, however, that it is only when the siphon pipe is very short that its summit can be raised to 28 or 30 feet above the level of the water in the discharge or outlet basin, because of the necessity for making an allowance for the friction in the pipe. The effect of that friction can be calculated by rules to be found in any treatise on hydraulics.

"3. It must also be observed that the exhausting pump at the summit of he siphon ought to be kept always ready for use when required, for all water contains air in suspension, and that air disengages itself by degrees when the water is exposed to a diminished pressure; and there is thus a tendency to the slow and gradual accumulation of air at the summit of a siphon.

"4. The method of drainage by means of siphon pipes has already been put in practice in this country on a very large scale, and with perfect success. Annexed is a very brief account of the work referred to, which was executed in 1862. A detailed description by the engineer, John Hawkshaw, Esq.,

F.R.S., was published in the 'Transactions of the Institution of Civil Engineers' for 1863.

(Signed) "W. J. Macquorn Rankine,
"Consulting Engineer to the Highland and Agricultural
"Society of Scotland.

"Glasgow, 17th December 1867."

From Professor Rankine's "Civil Engineering." Addendum to article 424, page 728.

"*Siphons for Tidal Drainage.*—The waters of the middle level drainage canal are discharged over the top of an embankment, through sixteen parallel siphons, each of 3½ feet bore and 1⅛ inch thick. The summits of the siphons are 20 feet above, and their lower ends 1½ foot below low water of spring tides. They have flap valves, opening down stream, at both ends; the lower valve can be made fast with a bridle when required. The air is exhausted from their summits, when required, by an air-pump having three cylinders of 15 inches diameter and 18 inches stroke, driven by a high-pressure steam-engine of ten-horse power. The floor of the canal at the inlets and outlets is protected by a wooden apron."—*J. Hawkshaw, C.E., F.R.S., in the Proceedings of the Institution of Civil Engineers, April* 1863.

The Secretary was instructed to thank Mons. Cretin Borne for his communication, and to send him a copy of the remarks by Professor Macquorn Rankine.

Farming in South Africa.—The following communication, addressed to the Secretary, by Mr J. J. Pratt, Consul-General, South African Republic, was submitted :—

"Consulate, South African Republic,
69 Fenchurch Street, E.C.,
London, 16th December 1867.

"Sir,—From your general knowledge of the agricultural interest in your locality, I have the honour to address you, not with the view of promoting emigration so much as opening a medium through which information may be disseminated relative to the South African Republic, which up to lately has been very little known, but is daily attracting increased attention, few countries offering equal advantages in pasturage, water, or general fertility of soil for sheep farming, cattle breeding, or general agriculture—the pursuits of the greater part of its 25,000 white inhabitants. All who have had the opportunity of judging admit that no country enjoys a more healthy climate, rendered cool by its altitude, and in every way well suited to the constitution of Europeans.

"Coffee, tobacco, sugar, and other tropical products, are grown in suitable localities; while on the higher lying lands, similar to 'New Scotland' and 'Industria,' the finest wheat, cereals, and fruit thrive; indeed, farming common to England is most successfully carried on.

"Land at present being very cheap, will of itself be a safe and profitable investment, from the fact that it is intended to construct either a cheap line of railway, tramway, or road suitable for traction engines from the capital to the new settlements, and such other main roads, that will reduce the distance and decrease the cost of transport of produce.

"With such increased facilities, the South African Republic, otherwise known as the Transvaal, is destined to become the storehouse of South Africa, supplying the neighbouring States with grain and other cereals at present imported from foreign markets.

"As Consul-General for the country, I have received commissions from residents to find suitable purchasers for nine farms, of 6000 acres each, severally suited for sheep-runs, cattle, coffee, and general farming, diagrams of which I am expecting. As there may be from time to time further commis-

sions, it is my desire to appoint some party in connection with each Club as agent on commission to whom I could forward diagrams of farms for sale, with general information, and thus privately be the means of, I trust, pointing out a country the great natural advantages of which, both in a mineral and agricultural sense, is destined, as it becomes more known, to attract equal attention to Australia and New Zealand.

"I am expecting the Finance Minister by this or next month's mail, and shall be happy to forward information for the use of your Club, or those who may have sons or friends who contemplate leaving England.

"Any suggestion you make in furtherance of this object I shall feel great pleasure in receiving.—I am, Sir, yours very truly, J. J. Pratt."

MEETING OF DIRECTORS, 15th JANUARY 1868.

Mr Dudgeon of Cargen in the Chair.

The business had relation to the subjects to be brought forward at the General Meeting of this date.

PREMIUMS AWARDED BY THE SOCIETY IN 1867.

I.—REPORTS.

1. L.30 to the Rev. John Gillespie, A.M., Mouswald Manse, Dumfriesshire, for a Report on the Agriculture of Dumfriesshire.
2. L.20 to Christopher Young Michie, forester, Cullen House, Banffshire, for a Report on Larch Forests in Scotland.
3. The Gold Medal or L.10 to Robert E. Brown, agent to Major Stapylton, Wass, Oswaldkirk, Yorkshire, for a Report on the Formation and Management of Young Plantations.
4. The Gold Medal to James Purves, Lochend, Thurso, for a Report of the Reclamation of Waste Land on the farms of Lochend and Syster, in the county of Caithness.
5. The Gold Medal to Harry Shaw, Bogfern, Tarland, for a Report of Experiments on the Comparative Productiveness of Turnips in 1866.
6. The Gold Medal or L.10 to Russell Swanwick, Whittington, Chesterfield, for a Report of Experiments on the Action of Different Top-dressings on Wheat, Grass, and Cabbage in 1866.
7. The Medium Gold Medal or L.5 to Robert Hutchison of Carlowrie, Kirkliston, for a Report on Pruning the Rarer Coniferæ.
8. The Medium Gold Medal or L.5 to Christopher Young Michie, forester, Cullen House, for a Report on Trees not Liable to be Destroyed by Rabbits.
9. The Medium Gold Medal or L.5 to John Milne, Mains of Laithers, Turriff, for a Report of Experiments on the Comparative Productiveness of Turnips in 1866.
10. The Silver Medal to Ralph Carr, Hedgely, Alnwick, for a Report on the Silver Alder as a Nurse Plant to Oak.
11. The Silver Medal to Robert Hutchison of Carlowrie, for a Report on Trees not Liable to be Destroyed by Rabbits.
12. The Silver Medal to John Morrison, Coney Park Nursery, Stirling, for a Report on the Corsican Fir.
13. The Silver Medal to William Gilchrist, Forester, Castlemilk, Glasgow, for a Report on the Formation and Management of Young Plantations.

II.—GLASGOW SHOW, 1867.

Class I.—CATTLE.

AYRSHIRE.

Section

1. Bulls calved before 1st January 1865.—Premiums, L.20—L.10—and Bronze Medal. Breeder of best Bull—Silver Medal. 1*st.* Robert Wilson, Forehouse, Kilbarchan. 2*d.* W. A. MacLachlan of Auchentroig, Balfron. 3*d.* William Buchanan, Coxithill, Stirling. Commended—John Stewart, Burnside, Strathaven. Breeder of best Bull—Robert Kerr, Wattieston, Kilbirnie.
2. Bulls calved after 1st January 1865.—Premiums, L.20—L.10—and Bronze Medal. 1*st.* John Dick, Shirrel, Bellshill. 2*d.* Robert Wilson, Forehouse, Kilbarchan. 3*d.* John Parker, Broomlands, Irvine. Commended—John Craig, Jellyhill, Bishopbriggs.
3. Bulls calved after 1st January 1866.—Premiums, L.10—L.5—and Bronze Medal. 1*st.* John Fleming, Meadowbank Cottage, Strathaven. 2*d.* David Forrester, Woodcockdale Cottage, Linlithgow. 3*d.* John Fleming, Meadowbank Cottage, Strathaven. Commended—Arch. Gall, Benthall, East Kilbride.

First Prize Cows at former Shows—Exhibited for Medium Gold Medal.

Glasgow, 1857, when the property of James Frew, Balmalloch—"Premium."—The Duchess-Dowager of Athole, Dunkeld.

Inverness, 1865, when the property of the present Exhibitor—"Whitelegs."—The Duchess-Dowager of Athole, Dunkeld.

4. Cows, in milk, calved before 1st January 1864.—Premiums, L.20—L.10—and Bronze Medal. 1*st.* John Jackson, Barnhill, Blantyre. 2*d.* James Cleland, Bellshill, Bothwell. 3*d.* William Wilson, South Biggart, Beith. Commended—Robert Wilson, Forehouse, Kilbarchan.
5. Cows, in milk, calved after 1st January 1864.—Premiums, L.15—L.8—and Bronze Medal. 1*st.* James Pollock, Blackhouse, Mearns. 2*d.* Lawrence Drew, Merryton Home Farm, Hamilton. 3*d.* Robert Wilson, Forehouse, Kilbarchan. Commended—Lawrence Drew, Merryton.
6. Cows, in calf, of any age.—Premiums, L.15—L.8—and Bronze Medal. 1*st.* Robert Wilson, Forehouse, Kilbarchan. 2*d.* David Forrester, Woodcockdale Cottage, Linlithgow. 3*d.* John Pender, Springhill, Motherwell. Commended—John Stewart, Burnside, Strathaven.
7. Heifers calved after 1st January 1865.—Premiums, L.10—L.5—and Bronze Medal. 1*st.* Lawrence Drew, Merryton Home Farm, Hamilton. 2*d.* James Muir, Hardington Mains, Biggar. 3*d.* Alexander Campbell, Crosshill, Bishopbriggs. Commended—Lawrence Drew, Merryton.
8. Heifers calved after 1st January 1866.—Premiums, L.8—L.4—and Bronze Medal. 1*st.* John Meikle, Seafield, Bathgate. 2*d.* James Mitchell, Blackhouse, Newton Mearns. 3*d.* Lawrence Drew, Merryton. Commended—Lawrence Drew, Merryton.

SHORT-HORN.

9. Bulls calved before 1st January 1865.—Premiums, L.20—L.10—and Bronze Medal. Breeder of best Bull—Silver Medal. 1*st.* Sir Thomas Buchan Hepburn, Bart., Prestonkirk. 2*d.* James Whyte, Little Clinterty, Blackburn. 3*d.* Lord Kinnaird, K.T., Rossie Priory. Commended—The Duke of Montrose. Breeder of best Bull—T. Marshall, The Howes, Annan.

Section

10. Bulls calved after 1st January 1865.—Premiums, L.20—L.10—and Bronze Medal. 1*st.* Sir William Stirling Maxwell, Bart., M.P. 2*d.* George Robertson Barclay of Keavil, Dunfermline. 3*d.* Lord Kinnaird, K.T., Rossie Priory, Inchture.
11. Bulls calved after 1st January 1866.—Premiums, L.10—L.5—and Bronze Medal. 1*st.* Lawrence Drew, Merryton, Hamilton. 2*d.* James Geddes, Orbliston, Fochabers. 3*d.* Walter Scott, Glendronach, Huntly. Commended—Alexander Bell, Linton, Kelso.

First Prize Cows at former Shows—Exhibited for Medium Gold Medal. Inverness, 1865, when the property of present Exhibitor—"Rosa Bonheur."—Viscount Strathallan, Strathallan Castle.

12. Cows of any Age.—Premiums, L.15—L.8—and Bronze Medal. 1*st*, Francis Brown, Mains of Leslie, Inch, Aberdeen. 2*d.* David M'Gibbon Inveravon, Polmont. 3*d.* Andrew Longmore, Rettie, Banff. Commended—Andrew Longmore, Rettie, Banff.
13. Heifers calved after 1st January 1865.—Premiums, L.10—L.5—and Bronze Medal. 1*st.* Lord Kinnaird, K.T., Rossie Priory, Inchture. 2*d.* Viscount Strathallan, Strathallan Castle. 3*d.* David Ainslie of Costerton, Blackshiels. Commended—Alex. Buchanan, Whitehouse, Stirling.
14. Heifers calved after 1st January 1866.—Premiums, L.8—L.4—and Bronze Medal. 1*st.* Lord Kinnaird, K.T., Rossie Priory, Inchture. 2*d.* David Ainslie of Costerton, Blackshiels. 3*d.* Duke of Buccleuch and Queensberry, K.G., Dalkeith. Commended—Duke of Montrose, K.T., Buchanan Castle.

POLLED (ANGUS OR ABERDEEN).

15. Bulls calved before 1st January 1865.—Premiums, L.20—L.10—and Bronze Medal. Breeder of best Bull—Silver Medal. 1*st.* The Earl of Southesk, Kinnaird Castle, Brechin. 2*d.* Robert Walker, Hillside House, Portlethen, Aberdeen. 3*d.* Not forward. Breeder of best Bull—The Earl of Southesk.
16. Bulls calved after 1st January 1865.—Premiums, L.20—L.10—and Bronze Medal. 1*st.* James Leslie, The Thorn, Blairgowrie. 2*d.* James Leslie, The Thorn, Blairgowrie. 3*d.* James Anderson, Newbigging, Dundee.
17. Bulls calved after 1st January 1866.—Premiums, L.10—L.5—and Bronze Medal.—No Competition.
18. Cows of any Age.—Premiums, L.15—L.8—and Bronze Medal. 1*st.* Colonel Fraser, of Castle Fraser, Aberdeen. 2*d.* James Leslie, The Thorn, Blairgowrie. 2*d.* Robert Walker, Hillside House, Portlethen.
19. Heifers calved after 1st January 1865.—Premiums, L.10—L.5—and Bronze Medal. 1*st.* Colonel Fraser, Castle Fraser, Aberdeen. 2*d.* No Competition. 3*d.* No Entry.
20. Heifers calved after 1st January 1866.—Premiums, L.8—L.4—and Bronze Medal. 1*st.* James Leslie, The Thorn, Blairgowrie. 2*d.* No Entry.

POLLED (GALLOWAY).

21. Bulls calved before 1st January 1865.—Premiums, L.20—L.10—and Bronze Medal. Breeder of best Bull—Silver Medal. 1*st.* James Cunningham, Tarbreoch, Dalbeattie. 2*d.* William and Robert Callander, Dalquhain, Dumfries. 3*d.* No Entry. Breeder of best Bull—John Underwood, Crofts, Castle Douglas.
22. Bulls calved after 1st January 1865.—Premiums, L.20—L.10—and Bronze Medal. 1*st.* William Clark, Corra, Kirkgunzeon, Dumfries.

Section

2*d*. John Thomson, Blaiket, Crocketford, Dumfries. 3*d*. James Graham, Parcelstown, West Linton, Carlisle.

23. Bulls calved after 1st January 1866.—Premiums, L.10—L.5—and Bronze Medal. 1*st*. James Graham, Braidlee, Newcastleton. 2*d*. Joseph Craik, East Glenarm, Crocketford. 3*d*. No Entry.

First Prize Cows at former Shows, Exhibited for Medium Gold Medal. Inverness, 1865, when the property of the present Exhibitor—"Kate." John Cunningham, Whitecairn, Dalbeattie.

24. Cows of any Age.—Premiums, L.15—L.8—and Bronze Medal. 1*st*. John Cunningham, Whitecairn, Dalbeattie. 2*d*. James Graham, Parcelstown, West Linton, Carlisle. 3*d*. James Cunningham, Tarbreoch, Dalbeattie.

25. Heifers calved after 1st January 1865.—Premiums, L.10—L.5—and Bronze Medal. 1*st*. James Cunningham, Tarbreoch, Dalbeattie. 2*d*. James Cunningham, Tarbreoch, Dalbeattie. 3*d*. James Graham, Parcelstown, West Linton.

26. Heifers calved after 1st January 1866.—Premiums, L.8—L.4—and Bronze Medal. 1*st*. James Cunningham, Tarbreoch, Dalbeattie. 2*d*. James Cunningham, Tarbreoch, Dalbeattie. 3*d*. James Cunningham, Tarbreoch, Dalbeattie. Commended—James Cunningham, Tarbreoch, Dalbeattie.

HIGHLAND.

First Prize Bulls at former Shows, Exhibited for Medium Gold Medal. Inverness, 1865, when the property of the present Exhibitor—"Donald." The Duke of Athole, Blair Castle, Blair Athole.

27. Bulls calved before 1st January 1864.—Premiums, L.20—L.10—and Bronze Medal. 1*st*. Robert Peter, Urlar, Aberfeldy. 2*d*. Archibald Clark, Garvie, Colintraive. 3*d*. John Malcolm, of Poltalloch, Callton Mor, Lochgilphead. Commended—The Duke of Athole, Blair Castle.

28. Bulls calved after 1st January 1864.—Premiums, L.20—L.10—and Bronze Medal. 1*st*. Donald M'Laren, Corrychrone, Callander. 2*d*. The Duke of Athole, Blair Castle, Blair Athole. 3*d*. John Stewart, Flodigary, Portree. Commended—John Malcolm, of Poltalloch, Lochgilphead.

29. Bulls calved after 1st January 1865.—Premiums, L.10—L.5—and Bronze Medal. 1*st*. The Duke of Athole, Blair Castle, Blair Athole. 2*d*. The Duke of Athole, Blair Castle, Blair Athole. 3*d*. D. M'Arthur, Achadunan, Cairndow. Commended—Donald M'Laren, Corrychrone, Callander.

First Prize Cows at former Shows, Exhibited for Medium Gold Medal. Stirling, 1864, when the property of the present Exhibitor—"Newrack." John Malcolm, of Poltalloch, Lochgilphead.

30. Cows of any Age.—Premiums, L.15—L.8—and Bronze Medal. 1*st*. John Malcolm, of Poltalloch, Lochgilphead. 2*d*. The Duke of Athole, Blair Castle, Blair Athole. 3*d*. John Malcolm, of Poltalloch, Lochgilphead. Commended—A. Pollok of Ronachan, Clachan, Kintyre.

31. Heifers calved after 1st January 1864—Premiums, L.10—L.5—and Bronze Medal. 1*st*. John Stewart, Flodigary, Portree. 2*d*. Donald M'Laren, Corrychrone, Callander. 3*d*. John Malcolm of Poltalloch, Lochgilphead. Commended—Allan Pollok of Ronachan.

32. Heifers calved after 1st January 1865.—Premiums, L.8—L.4—and Bronze Medal. 1*st*. John Malcolm, of Poltalloch, Lochgilphead. 2*d*. John Malcolm, of Poltalloch, Lochgilphead. 3*d*. John Malcolm, of

Section

Poltalloch, Lochgilphead. Commended—The Hon. Lady Menzies of Menzies.

FAT STOCK.

33. Oxen of any pure or Cross Breed calved after 1st January 1864.—Premiums, Medium Gold—Silver—and Bronze Medals. 1*st*. Arthur J. Balfour, of Whittingham, Prestonkirk. 2*d*. Richard Heath Harris, Earnhill, Forres. 3*d*. Harry L. L. Morrison, Guise, Whitehouse, Aberdeen.
34. Oxen of any Pure or Cross Breed calved after 1st January 1865.—Premiums, Medium Gold—Silver—and Bronze Medals. 1*st*. George Syme, Couston, Aberdour, Fife. 2*d*. George Syme, Couston, Aberdour, Fife. 3*d*. The Duke of Montrose, K.T., Buchanan Castle, Glasgow. Commended—Arthur J. Balfour, of Whittingham.
35. Highland Oxen calved after 1st January 1863.—Premiums, Medium Gold—Silver—and Bronze Medals. 1*st*. James Stewart, Newmarket, Aberdeen. 2*d*. No Entry.
36. Highland Oxen calved after 1st January 1864.—Premiums, Medium Gold—Silver—and Bronze Medals. 1*st*. The Duke of Athole, Blair Castle, Blair Athole. 2*d*. The Duke of Athole, Blair Castle, Blair Athole. 3*d*. No Entry.
37. Cross Heifers calved after 1st January 1865.—Premiums, Medium Gold—Silver—and Bronze Medals. 1*st*. Alexander Bruce, Keig, Whitehouse, Aberdeen. 2*d*. No Entry.

EXTRA CATTLE.

Silver Medals were awarded to the following:—Sir John P. Orde, Bart., of Kilmory, Lochgilphead, for Cow and Calf (Athole Breed). Sir John P. Orde, Bart., of Kilmory, Lochgilphead, for Bull (Indian Breed). Sir John P. Orde, Bart., of Kilmory, Lochgilphead, for Cow and Calf (Indian Breed). William Wingate, Nether Croy, Kilsyth, for Cow (Jersey Breed).

Class II.—HORSES

FOR AGRICULTURAL PURPOSES.

First Prize Stallions at former Shows—Exhibited for Medium Gold Medal.
Kelso, 1863, when the property of the present Exhibitor—
"Campsie." David Riddell, Kilbowie, Duntocher.
Stirling, 1864, when the property of the present Exhibitor—
"Lord Clyde." Andrew Logan, Crossflat, Kilbarchan.

1. Stallions foaled before 1st January 1864.—Premiums, L.30—L.15—and Bronze Medal. Breeder of best Stallion—Silver Medal. 1*st*. Samuel Clark, Manswrae, Kilbarchan. 2*d*. Alexander Galbraith, Croy Cunningham, Killearn. 3*d*. John M'Donald, Duntocher. Commended—Robert Brewster, Barnbeth, Kilbarchan. Breeder of best Stallion—John Gemmell, Overton, Lochwinnoch.
2. Entire Colts foaled after 1st January 1864.—Premiums, L.20—L.10—and Bronze Medal. 1*st*. William Rigg, Banks, Kirkcudbright. 2*d*. William Moffat, Shirva, Kirkintilloch. 3*d*. Robert Arkley, Philipstown, Linlithgow. Commended—Alexander Galbraith, Croy Cunningham.
3. Entire Colts foaled after 1st January 1865.—Premiums, L.15—L.8—and Bronze Medal. 1*st*. Sir William Stirling Maxwell, of Keir, Bart., M.P. 2*d*. Samuel Clark, Manswrae, Kilbarchan. 3*d*. Robert Andrew, Allans, Paisley. Commended—Robert M'Kean, Lumloch, Bishopbriggs.
4. Entire Colts foaled after 1st January 1866.—Premiums, L.10—L.5—and Bronze Medal. 1*st*. David Riddell, Kilbowie, Duntocher. 2*d*. J. N.

Section

Fleming, Keil, Campbeltown. *3d.* Thomas Muir, Bowhouse, Lanark
Commended—William Kerr, Newhouse, Dalry.

First Prize Mares at former Shows—Exhibited for Medium Gold Medal.
Edinburgh, 1859, when the property of the present Exhibitor—
"Sally." Sir William Stirling Maxwell, of Keir, Bart., M.P.
Battersea, 1862, when the property of the present Exhibitor—
"Nancy." Sir William Stirling Maxwell, of Keir, Bart., M.P.
Stirling, 1864, when the property of the present Exhibitor—
"Peggy." Sir William Stirling Maxwell, of Keir, Bart., M.P.
Stirling, 1864, when the property of the present Exhibitor—
Mare. Alexander Buchanan, Garscadden Mains.
Kelso, 1863, when the property of Duke of Hamilton—
Mare. Lawrence Drew, Merryton, Hamilton.

5. Mares, with Foal at foot, foaled after 1st January 1864.—Premiums, L.20—L.10—and Bronze Medal. *1st.* John Watson, jun., Glencairn House, Motherwell. *2d.* John Findlay, Boturich Castle, Dumbarton. *3d.* Lawrence Drew, Merryton Home Farm, Hamilton.
6. Mares, in Foal, foaled before 1st January 1864.—Premiums, L.15—L.8—and Bronze Medal. *1st.* Lawrence Drew, Merryton Home Farm, Hamilton. *2d.* John Hendrie, Kirkwood, Coatbridge. *3d.* The Duchess Dowager of Athole, Dunkeld. Commended—William Moffat, Shirva, Kirkintilloch.
7. Fillies foaled after 1st January 1864.—Premiums, L.10—L.5—and Bronze Medal. *1st.* Lawrence Drew, Merryton Home Farm, Hamilton. *2d.* John Buchanan, Coldrach, Drymen. *3d.* Robert Weir, Brownhill, Carnwath. Commended—William Veitch, Castlehill, Houston.
8. Fillies foaled after 1st January 1865.—Premiums, L8—L.4—and Bronze Medal. *1st.* Alex. Buchanan, Garscadden Mains, East Kilpatrick. *2d.* Lawrence Drew, Merryton Home Farm, Hamilton. *3d.* Moses Steven, of Bellahouston, Glasgow. Commended—Robert M. Buchanan, Livingston Mill, Mid-Calder.
9. Fillies foaled after 1st January 1866.—Premiums, L.6—L.3—and Bronze Medal. *1st.* Peter Crawford, Dumgoyack, Strathblane. *2d.* David M'Gibbon, Inveravon, Polmont. *3d.* A. B. Yuille, of Darleith, Cardross. Commended—Abram Kerr, Castle Hill, Durrisdeer.

EXTRA SECTIONS.

10. Mares or Geldings foaled before 1st January 1863, suitable for Field.—Premiums, L.20—L.10—and Bronze Medal. *1st.* Lawrence Drew, Merryton, Hamilton. *2d.* Andrew Hunter, 18 Cleveland Street, Glasgow. *3d.* James Mackie, of Bargaly, M.P., Castle Douglas.
11. Mares or Geldings foaled between 1st January 1863 and 1st January 1864, suitable for Field.—Premiums, L.20—L.10—and Bronze Medal. *1st.* George Stodart, Netherton, Newton Mearns. *2d.* John Newton, Chollerton, Hexham. *3d.* John Hepburn, Pitcairn, Lochgelly.
12. Mares or Geldings foaled before 1st January 1863, suitable for Harness.—Premiums, L.20—L.10—and Bronze Medal. *1st.* A. J. H. Somerville, Bothwell. *2d.* Matthew Clark, Croftengea, Alexandria. *3d.* William White, Nether Arthurlie, Barrhead.
13. Draught Mares or Geldings in Harness.—Premiums, Medium Gold—Silver—and Bronze Medals. *1st.* Andrew Wallace, West Burn, Cambuslang. *2d.* David M'Gibbon, Inveravon, Polmont. *3d.* John Wallace, Stonelaw, Rutherglen. Commended—John Clark, Flender, Busby.
14. Mares or Geldings, not exceeding 15 Hands high, for Milk Carts of heavy draught.—Premiums, L.10—L.5—and Bronze Medal. *1st.* Robert

Section

Wilson, Forehouse, Kilbarchan. 2*d.* James Young, Duncanridge, East Kilbride. 3*d.* Archibald Bulloch, Milliken, East Kilpatrick.

15. Mares or Geldings, not exceeding 14½ hands high, for Milk Carts of light draught.—Premiums, L.10—L.5—and Bronze Medal. 1*st.* James Robertson, Maryhill, Glasgow. 2*d.* William Cockburn, jun., Glasgow. 3*d.* James Robertson, Maryhill, Glasgow. Commended—James Mackie, Springbank, Glasgow.

EXTRA HORSES.

Silver Medals were awarded to the following:—Archibald A. Spiers, of Elderslie, M.P., for Arabian Stallion. John Macarthur, Inverary, for Highland Stallion. John Black, Fern Bank, Bishopbriggs, for Pony Mare. Thomas Coutts Trotter, Bilston Lodge, Loanhead, for Pony Gelding. Blair Campbell, Auchinley, Dunblane, for Pony Gelding.

Class III.—SHEEP.

LEICESTER.

1. Tups not above 4 Shear.—Premiums, L.10—L.5—and Bronze Medal.—1*st.* David Ainslie of Costerton, Blackshiels. 2*d.* William Ruxton, Farnell, Brechin. 3*d.* Thomas Ferguson, Kinnochtry, Coupar-Angus. Commended—David M'Gibbon, Inveravon, Polmont.
2. Dinmont or Shearling Tups.—Premiums, L.10—L.5—and Bronze Medal.—1*st.* Duke of Buccleuch and Queensberry, K.G., Dalkeith. 2*d.* Duke of Buccleuch and Queensberry, K.G., Dalkeith. 3*d.* David Ainslie, of Costerton, Blackshiels. Commended—George Hope, Fenton Barns, Drem.
3. Ewes not above 4 Shear.—Premiums, L.8—L.4—and Bronze Medal.—1*st.* George Simson, Courthill, Kelso. 2*d.* John Angus, jun., Whitefield, Morpeth. 3*d.* George Hope, Fenton Barns, Drem. Commended—The Duke of Buccleuch and Queensberry, K.G., Dalkeith.
4. Shearling Ewes or Gimmers.—Premiums, L.8—L.4—and Bronze Medal.—1*st.* George Simson, Courthill, Kelso. 2*d.* William Purves, Linton Burnfoot, Kelso. 3*d.* David Ainslie, of Costerton, Blackshiels. Commended—Lawrence Drew, Merryton, Hamilton.

CHEVIOT.

5. Tups not above 4 Shear.—Premiums, L.10—L.5—and Bronze Medal.—1*st.* James Brydon, Kinnelhead, Moffat. 2*d.* Herbert Brydon, Thirlstane Hope, Selkirk. 3*d.* James Brydon, jun., Appin, Tynron. Commended—Thomas Welsh, Ericstane, Moffat.
6. Dinmont or Shearling Tups.—Premiums, L.10—L.5—and Bronze Medal.—1*st.* James Brydon, Kinnelhead, Moffat. 2*d.* James Brydon. Kinnelhead, Moffat. 3*d.* Charles Alexander, Easterknowes, Stobo, Peebles. Commended—John M'Gregor, Bellridding, Dumfries.
7. Ewes not above 4 Shear.—Premiums, L.8—L.4—and Bronze Medal. Best Pen of Lambs—Silver Medal. 1*st.* James Brydon, Kinnelhead, Moffat. 2*d.* John Archibald, Glengelt, Lauder. 3*d.* Sir Graham G. Montgomery, of Stanhope, Bart., M.P. Commended—Robert Shortreed, Attonburn, Kelso. Best Pen of Lambs—John Archibald, Glengelt, Lauder. Commended—James Brydon, Kinnelhead, Moffat.
8. Shearling Ewes or Gimmers.—Premiums, L.8—L.4—and Bronze Medal.—1*st.* James Brydon Kinnelhead, Moffat. 2*d.* John M'Gregor, Bellridding, Dumfries. 3*d.* Thomas Elliot, Hindhope, Jedburgh. Commended—W. G. Hunter, Dumfedling, Langholm.

Section

BLACKFACED.

9. Tups not above 4 Shear.—Premiums, L.10—L.5—and Bronze Medal.—1*st*. Thomas Aitken, Listonshiels, Balerno. 2*d*. John Archibald, Overshiels, Stow. 3*d*. J. Malcolm, of Poltalloch, Callton Mor, Lochgilphead. Commended—Thomas Murray, Eastside, Penicuik.
10. Dinmont or Shearling Tups.—Premiums, L.10—L.5—and Bronze Medal.—1*st*. John Watson, Culterallers, Biggar. 2*d*. John Archibald, Overshiels, Stow. 3*d*. Thomas Aitken, Listonshiels, Balerno. Commended—James Craig, Polquheys, New Cumnock.
11. Ewes not above 4 Shear.—Premiums, L.8—L.4—and Bronze Medal. Best Pen of Lambs—Silver Medal. 1*st*. John Archibald, Overshiels, Stow. 2*d*. John M'Laren, Corrie, Drymen. 3*d*. Thomas Murray, Eastside, Penicuik. Commended—J. Malcolm, of Poltalloch, Lochgilphead. Best Pen of Lambs—John Archibald, Overshiels, Stow. Commended—Thomas Murray, Eastside, Penicuik.
12. Shearling Ewes or Gimmers. Premiums, L.8—L.4—and Bronze Medal.—1*st*. J. Malcolm, of Poltalloch, Callton Mor, Lochgilphead. 2*d*. John Archibald, Overshiels, Stow. 3*d*. Thomas Murray, Eastside, Penicuik. Commended—John Craig, South Halls, Strathaven.

SOUTHDOWN.

13. Tups not above 4 Shear.—Premiums, L.10—L.5—and Bronze Medal.—1*st*. James Bruce, Burnside, Fochabers. 2*d*. James Bruce, Burnside, Fochabers. 3*d*. Robert Scot Skirving, Camptown, Drem. Commended—Robert Scot Skirving, Camptown.
14. Ewes not above 4 Shear, or Gimmers.—Premiums, L.8—L.4—and Bronze Medal.—1*st*. James Bruce, Burnside, Fochabers. 2*d*. Robert Scot Skirving, Camptown, Drem. 3*d*. Alexander Kinloch, yr. of Gilmerton, Drem.

LONG-WOOLLED OTHER THAN LEICESTER.

15. Tups not above 4 Shear.—Premiums, L.10—L.5—and Bronze Medal.—1*st*. Walter Reid, Drem. 2*d*. John Bell Irving, of Whitehill, Lockerbie. 3*d*. John Gibson, Woolmet, Dalkeith. Commended—John Bell Irving, of Whitehill, Lockerbie.
16. Ewes not above 4 Shear, or Gimmers. Premiums, L.8—L.4—and Bronze Medal.—1*st*. John Gibson, Woolmet, Dalkeith. 2*d*. John Bell Irving, of Whitehill, Lockerbie. 3*d*. Walter Reid, Drem. Commended—John Bell Irving, of Whitehill, Lockerbie.

SHORT-WOOLLED OTHER THAN SOUTHDOWN.

17. Tups not above 4 Shear.—Premiums, L.10—L.5—and Bronze Medal.——1*st*. John Gibson, Woolmet, Dalkeith. 2*d*. Earl of Strathmore, Glamis Castle, Forfar. 3*d*. John Gibson, Woolmet, Dalkeith. Commended—John Gibson, Woolmet, Dalkeith.
18. Ewes not above 4 Shear, or Gimmers.—Premiums, L.8—L.4—and Bronze Medal.—1*st*. John Gibson, Woolmet, Dalkeith. 2*d*. No Entry.

EXTRA SHEEP.

Silver Medals were awarded to the following:—Sir J. P. Orde, of Kilmory, Bart., for St Kilda Tups. Sir John P. Orde, Bart., for St Kilda Ewes and Gimmers.

Class IV.—SWINE.

Section

1. Boars, Large Breed.—Premiums, L.8—L.4—and Bronze Medal. 1*st.* Sir Thomas Miles Riddell, of Sunart, Bart. 2*d.* R. E. Duckering & Sons, Northorpe, Kirton Lindsay. 3*d.* No Award.
2. Boars, Small Breed.—Premiums, L.8—L.4—and Bronze Medal. 1*st.* George Mangles, Givendale, Ripon. 2*d.* Thomas D. Findlay, Easterhill, Glasgow. 3*d.* R. E. Duckering & Sons, Northorpe, Kirton Lindsay. Commended—Lawrence Drew, Merryton Home Farm, Hamilton.
3. Boars of a Breed not eligible for preceding Classes.—Premiums, L.8—L.4—and Bronze Medal. 1*st.* R. E. Duckering & Sons, Northorpe, Kirton Lindsay. 2*d.* David M'Gibbon, Inveravon, Polmont. 3*d.* Lawrence Drew, Merryton Home Farm, Hamilton.
4. Sows, Large Breed.—Premiums, L.6—L.3—and Bronze Medal. 1*st.* R. E. Duckering & Sons, Northorpe, Kirton Lindsay. 2*d.* Thomas D. Findlay, Easterhill, Glasgow. 3*d.* Lawrence Drew, Merryton Home Farm, Hamilton. Commended—T. D. Findlay, of Easterhill, Glasgow.
5. Sows, Small Breed.—Premiums, L.6—L.3—and Bronze Medal. 1*st.* R. E. Duckering & Sons, Northorpe, Kirton Lindsay. 2*d.* Thomas D. Findlay, Easterhill, Glasgow. 3*d.* Lawrence Drew, Merryton Home Farm, Hamilton. Commended—Jacob Wilson, Woodhorn Manor, Morpeth.
6. Sows of a Breed not eligible for preceding Classes.—Premiums, L.6—L.3—and Bronze Medal. 1*st.* R. E. Duckering & Sons, Northorpe, Kirton Lindsay. 2*d.* Lawrence Drew, Merryton Home Farm, Hamilton. 3*d.* Thomas D. Findlay, Easterhill, Glasgow. Commended—Jacob Wilson, Woodhorn Manor, Morpeth.
7. Pens of 3 Pigs not exceeding 8 months old, Large Breed.—Premiums, L.4—L.2—and Bronze Medal.—1*st.* Thomas D. Findlay, Easterhill, Glasgow. 2*d.* Lawrence Drew, Merryton Home Farm, Hamilton. 3*d.* No Entry.
8. Pens of 3 Pigs not exceeding 8 months old, Small Breed.—Premiums, L.4—L.2—and Bronze Medal. 1*st.* George Mangles, Givendale, Ripon. 2*d.* Robert Philp, Royal Hotel, Bridge of Allan. 3*d.* Thomas D. Findlay, Easterhill, Glasgow. Commended—J. Fleming, East Castleton, Carmunnock.
9. Pens of 3 Pigs not exceeding 8 months old, of a Breed not eligible for preceding Classes.—Premiums, L.4—L.2—and Bronze Medal. 1*st.* George Mangles, Givendale, Ripon. 2*d.* Lawrence Drew, Merryton Home Farm, Hamilton. 3*d.* John M'Kay, Cross Arthurlie, Barhead.

Class V.—POULTRY.

1. Silver Grey Dorking—Cock and 2 Hens.—Premiums, Silver and Bronze Medals. 1*st.* David Annan, Torr of Monzie, Cupar-Fife. 2*d.* Thomas Raines, Bridgehaugh, Stirling. Commended—Henry Heys, Springfield House, Barrhead.
2. Silver Grey Dorking—Cockerel and 2 Pullets.—Premiums, Silver and Bronze Medals. 1*st.* Thomas Raines, Bridgehaugh, Stirling. 2*d.* Lord Binning, Millerstain, Kelso. Commended—Henry Heys, Springfield House, Barrhead.
3. Coloured Dorking—Cock and 2 Hens.—Premiums, Silver and Bronze Medals. 1*st.* John M'Callum, Hosh Distillery, Crieff. 2*d.* John Allan, Crieffvechter, Crieff.

Section

4. Coloured Dorking—Cockerel and 2 Pullets.—Premiums, Silver and Bronze Medals. 1*st.* John M'Callum, Hosh Distillery, Crieff. 2*d.* Thomas Raines, Bridgehaugh, Stirling. Commended—John Allan, Crieffvechter, Crieff.
5. White Dorking—Cock and 2 Hens.—Premiums, Silver and Bronze Medals. 1*st.* John Aitken, Paisley. 2*d.* John Sharp, Johnstone, Renfrew.
6. White Dorking—Cockerel and 2 Pullets.—Premiums, Silver and Bronze Medals. No Entry.
7. Coloured Cochin-China—Cock and 2 Hens.—Premiums, Silver and Bronze Medals. 1*st.* John Stuart, Thistlebank, Helensburgh. 2*d.* John Stuart, Thistlebank, Helensburgh.
8. Coloured Cochin-China—Cockerel and 2 Pullets.—Premiums, Silver and Bronze Medals. 1*st.* John Stuart, Thistlebank, Helensburgh. 2*d.* William Ford, Hardengreen, Dalkeith. Commended—John Stuart, Thistlebank, Helensburgh.
9. White Cochin-China—Cock and 2 Hens.—Premiums, Silver and Bronze Medals. 1*st.* Miss Biggar, Braes House, Ecclefechan. 2*d.* John Stuart, Thistlebank, Helensburgh.
10. White Cochin-China—Cockerel and 2 Pullets.—Premiums, Silver and Bronze Medals. 1*st.* Miss Biggar, Braes House, Ecclefechan. 2*d.* William Ford, Hardengreen, Dalkeith.
11. Pencilled Bramahpootra—Cock and 2 Hens.—Premiums, Silver and Bronze Medals. 1*st.* Thomas Raines, Bridgehaugh, Stirling. 2*d.* David Annan, Torr of Monzie, Cupar-Fife. Commended—John Stuart, Thistlebank, Helensburgh.
12. Pencilled Bramahpootra—Cockerel and 2 Pullets.—Premiums, Silver and Bronze Medals. 1*st.* John Stuart, Thistlebank, Helensburgh. 2*d.* George Muirhead, Durdie, Errol. Commended—John Stuart, Thistlebank, Helensburgh.
13. Light Bramahpootra—Cock and 2 Hens.—Premiums, Silver and Bronze Medals. No Competition.
14. Light Bramahpootra—Cockerel and 2 Pullets.—Premiums, Silver and Bronze Medals. 1*st.* George Muirhead, Durdie, Errol. 2*d.* No Entry.
15. Malay—Cock and 2 Hens.—Premiums, Silver and Bronze Medals. No Entry.
16. Malay—Cockerel and 2 Pullets.—Premiums, Silver and Bronze Medals. No Entry.
17. Spanish—Cock and 2 Hens.—Premiums, Silver and Bronze Medals. 1*st.* John Dunlop, 82 Broomlands Street, Paisley.
18. Spanish—Cockerel and 2 Pullets.—Premiums, Silver and Bronze Medals. 1*st.* John Dunlop, 82 Broomlands Street, Paisley. 2*d.* John Dunlop, 82 Broomlands Street, Paisley.
19. Scotch Grey—Cock and 2 Hens.—Premiums, Silver and Bronze Medals. 1*st.* Alexander Grant, Glentayen Mill, Kilbarchan. 2*d.* William Park, Morton Cottage, Parkhead. Commended—Stephen Young, Kirkton Mill, Neilston.
20. Scotch Grey—Cockerel and 2 Pullets.—Premiums, Silver and Bronze Medals. 1*st.* Robert Macnab, Cardonald, Govan. 2*d.* William M. Gilmour, Shawburn, Hamilton. Commended—Stephen Young, Kirkton Mill, Neilston.
21. Golden Pencilled Hamburg—Cock and 2 Hens.—Premiums, Silver and Bronze Medals. 1*st.* James Mitchell, 50 Causeyside Street, Paisley. 2*d.* John Lindsay, Thornhill, Stewarton. Commended—J. Dryburgh, Arkleston House, Paisley.
22. Golden Pencilled Hamburg—Cockerel and 2 Pullets.—Premiums, Silver and Bronze Medals. 1*st.* James Mitchell, 50 Causeyside Street, Paisley. 2*d.* No Entry.

Section

23. Silver Pencilled Hamburg—Cock and 2 Hens.—Premiums, Silver and Bronze Medals. 1*st*. John Lindsay, Thornhill, Stewarton. 2*d*. Archibald Glendinning, Strathblane. Commended—James Logan, Eastshield, Carnwath.
24. Silver Pencilled Hamburg—Cockerel and 2 Pullets.—Premiums, Silver and Bronze Medals. No Competition.
25. Golden Spangled Hamburg—Cock and 2 Hens.—Premiums, Silver and Bronze Medals. 1*st*. Thomas Bruce, Busby. 2*d*. Hugh Currie, 15 Princes Street, Ardrossan.
26. Golden Spangled Hamburg—Cockerel and 2 Pullets.—Premiums, Silver and Bronze Medals. 1*st*. Hugh Currie, 15 Princes Street, Ardrossan. 2*d*. Thomas Bruce, Busby.
27. Silver Spangled Hamburg—Cock and 2 Hens.—Premiums, Silver and Bronze Medals. 1*st*. Allan Glen, Erskine, Bishopton. 2*d*. John Stewart, South Arthurlie, Barrhead.
28. Silver Spangled Hamburg—Cockerel and 2 Pullets.—Premiums, Silver and Bronze Medals. 1*st*. Allan Glen, Erskine, Bishopton. 2*d*. John Stewart, South Arthurlie, Barrhead.
29. White Crested Black Polish—Cock and 2 Hens.—Premiums, Silver and Bronze Medals. No Entry.
30. White Crested Black Polish—Cockerel and 2 Pullets.—Premiums, Silver and Bronze Medals. 1*st*. Robert Macnab, Cardonald, Govan. 2*d*. No Entry.
31. Golden Spangled Polish—Cock and 2 Hens.—Premiums, Silver and Bronze Medals. 1*st*. W. R. Menzies, Moss-side Cottage, Crossmyloof. 2*d*. No Entry.
32. Golden Spangled Polish—Cockerel and 2 Pullets.—Premiums, Silver and Bronze Medals. No Entry.
33. Silver Spangled Polish—Cock and 2 Hens.—Premiums, Silver and Bronze Medals.—No Entry.
34. Silver Spangled Polish—Cockerel and 2 Pullets.—Premiums, Silver and Bronze Medals.—No Entry.
35. Game, Black or Brown Reds—Cock and 2 Hens. Premiums, Silver and Bronze Medals. 1*st*. John H. Macnab, South Arthurlie, Barrhead. 2*d*. W. D. Dickson, Carroncroft, Thornhill. Commended—John H. Macnab, South Arthurlie, Barrhead.
36. Game, Black or Brown Reds—Cockerel and 2 Pullets.—Premiums, Silver and Bronze Medals. 1*st*. John H. Macnab, South Arthurlie, Barrhead. 2*d*. John H. Macnab, South Arthurlie, Barrhead.
37. Game—Duckwings—Cock and 2 Hens.—Premiums, Silver and Bronze Medals. 1*st*. W. R. Menzies, Moss-side Cottage, Crossmyloof. 2*d*. No Entry.
38. Game—Duckwings—Cockerel and 2 Pullets.—Premiums, Silver and Bronze Medals.—No Entry.
39. Any other variety of Game—Cock and 2 Hens.—Premiums, Silver and Bronze Medals.—No Entry.
40. Any other variety of Game—Cockerel and 2 Pullets.—Premiums, Silver and Bronze Medals.—No Entry.
41. Bantams—Game—Cock and 2 Hens.—Premiums, Silver and Bronze Medals. 1*st*. John Sharp, Johnstone, Renfrewshire. 2*d*. William M. Gilmour, Shawburn, Hamilton.
42. Bantams—Game—Cockerel and 2 Pullets.—Premiums, Silver and Bronze Medals. 1*st*. John Sharp, Johnstone, Renfrewshire.
43. Bantams—Gold-laced Sebright—Cock and 2 Hens.—Premiums, Silver and Bronze Medals. 1*st*. David Ainslie, of Costerton, Blackshiels. 2*d*. Lord Binning, Mellerstain, Kelso.

Section

44. Bantams—Gold-laced Sebright—Cockerel and 2 Pullets.—Premiums, Silver and Bronze Medals. 1*st*. David Ainslie, of Costerton, Blackshiels. 2*d*. No Entry.
45. Bantams—Silver-laced Sebright—Cock and 2 Hens.—Premiums, Silver and Bronze Medals. 1*st*. David Ainslie, of Costerton, Blackshiels. 2*d*. Lord Binning, Mellerstain, Kelso.
46. Bantams—Silver-laced Sebright—Cockerel and 2 Pullets.—Premiums, Silver and Bronze Medals.—No Entry.
47. Any other variety of Bantams—Cock and 2 Hens.—Premiums, Silver and Bronze Medals. 1*st*. James Dryburgh, Arkleston House, Paisley. 2*d*. No Entry.
48. Any other variety of Bantams—Cockerel and 2 Pullets.—Premiums, Silver and Bronze Medals.—No Entry.
49. Any other distinct Breed of Poultry—Cock and 2 Hens.—Premiums, Silver and Bronze Medals. 1*st*. Charles Thomson, Viewfield, Newton-on-Ayr. 2*d*. No Entry.
50. Any other distinct Breed of Poultry—Cockerel and 2 Pullets.—Premiums, Silver and Bronze Medals.—No Entry.
51. Capons of any Breed—3 Capons.—Premiums, Silver and Bronze Medals.—No Entry.
52. Ducks—White Aylesbury—Drake and 2 Ducks.—Premiums, Silver and Bronze Medals. 1*st*. James Dryburgh, Arkleston House, Paisley. 2*d*. Henry Heys, Springfield House, Barrhead.
53. Ducks—White Aylesbury—Drake and 2 Ducklings.—Premiums, Silver and Bronze Medals. 1*st*. Lord Binning, Mellerstain, Kelso. 2*d*. John Sharp, Johnstone, Renfrewshire.
54. Ducks—Rouen—Drake and 2 Ducks.—Premiums, Silver and Bronze Medals. 1*st*. John H. Macnab, South Arthurlie, Barrhead. 2*d*. Alexander Grant, Glentayen Mill, Kilbarchan.
55. Ducks—Rouen—Drake and 2 Ducklings.—Premiums, Silver and Bronze Medals. 1*st*. John Sharp, Johnstone, Renfrewshire. 2*d*. Miss Malcolm, of Poltalloch, Lochgilphead.
56. Ducks—Any other distinct Breed.—Premiums, Silver and Bronze Medals. 1*st*. John Pollok, West Walton, Neilston. 2*d*. Peter Wilson, Lansaig, Tigh-na-bruiach.
57. Ducks—Any other distinct Breed.—Premiums, Silver and Bronze Medals.—No Entry.
58. Turkeys—Black Norfolk—Cock and 2 Hens.—Premiums, Silver and Bronze Medals.—No Entry.
59. Turkeys—Black Norfolk—Cock and 2 Hens (Poults).—Premiums, Silver and Bronze Medals.—No Entry.
60. Turkeys—Any other Breed—Cock and 2 Hens.—Premiums, Silver and Bronze Medals. 1*st*. Lord Binning, Mellerstain, Kelso. 2*d*. No Entry.
61. Turkeys—Any other Breed—Cock and 2 Hens (Poults).—Premiums, Silver and Bronze Medals.—No Entry.
62. Geese—Grey Toulouse—Gander and 2 Geese.—Premiums, Silver and Bronze Medals.—No Entry.
63. Geese—Grey Toulouse—Gander and 2 Goslings.—Premiums, Silver and Bronze Medals.—No Entry.
64. Geese—Emden—Gander and 2 Geese.—Premiums, Silver and Bronze Medals. 1*st*. Henry Heys, Springfield House, Barrhead. 2*d*. No Entry.
65. Geese—Emden—Gander and 2 Goslings.—Premiums, Silver and Bronze Medals.—No Entry.

Class VI.—DAIRY PRODUCE.

Section

1. Cured Butter.—Premiums, L.5—L.3—and Bronze Medal. 1*st.* Andrew Lithgow, Drumtall, East Kilbride. 2*d.* Gavin Muir, Fingart, Neilston. 3*d.* Arthur Gilmour, of Crosshill, East Kilbride. Commended—David Aikenhead, East Kilbride.
2. Powdered Butter.—Premiums, L.5—L.3—and Bronze Medal. 1*st.* Arthur Gilmour, of Crosshill, East Kilbride. 2*d.* Andrew Lithgow, Drumtall, East Kilbride. 3*d.* Alexander Aikenhead, New Farm, East Kilbride. Commended—William Pollock, Mains, East Kilbride.
3. Fresh Butter.—Premiums, L.5—L.3—and Bronze Medal. 1*st.* Thomas Morton, Dalmuir, West Kilpatrick. 2*d.* Andrew Lithgow, Drumtall, East Kilbride. 3*d.* Andrew Aitkenhead, Murray, East Kilbride. Commended—Donald Macfarlane, Bishopbriggs.
4. Sweet Milk Cheeses—Cheddar Variety.—Premiums, L.5—L.3—and Bronze Medal. 1*st.* James Cowper, Mid Kelton, Castle Douglas. 2*d.* Andrew Allan, Munnoch, Dalry. 3*d.* John Mackie, Sarkshiels, Kirkpatrick-Fleming.
5. Two Sweet Milk Cheeses—Any other Variety.—Premiums, L.5—L.3—and Bronze Medal. 1*st.* Alex. Dunlop, Middlecroft, Strathaven (Dunlop). 2*d.* Hugh Whyte, Nether Craigends, Kilbarchan. 3*d.* Mrs Dickie, Girthill, Dalry (North Wiltshire).

Class VII.—IMPLEMENTS.

The following Implements, &c., were recommended for trial:—

Barometers.—T. Littlewood and Co., Glasgow.
Barrows, Shovels, Bins, and Troughs.—John Pringle, Edinburgh.
Centrifugal Pump and Fan.—Williamson Brothers, Kendal.
Chaff Cutter.—Richmond and Chandler, Manchester.
Fanners.—A. B. Childs, London; James Elder, Corstorphine.
Fencing.—F. Morton & Co., Liverpool; A. & J. Main & Co., Glasgow.
Fire Engine or Extincteur.—W. B. Dick & Co., Glasgow.
Grain and Manure Drills.—Mrs Thomas Sherriff, Dunbar.
Grinding Machine and Files.—Mitchell & Burgess, Manchester.
Horse Gear.—Richmond & Chandler, Manchester.
Letter Box.—A. E. Jones, Glasgow.
Mangles.—W. M'Farlane, Glasgow.
Norwegian Drill Clod-Crusher.—A. M'Kerrow, Kilmarnock.
Ploughs and Fittings.—Alexander Denholm, Edinburgh; William Gray, Wishaw.
Potato Lifters.—Alexander Jack & Son, Maybole; John Pringle, Edinburgh; George Gowan, Drem; Thomas Hunter, Maybole; William Kirkwood, Dalkeith; Law, Duncan, & Co., Shettleston; A. & J. Main & Co., Glasgow; Thomas Reid, Monkton, Ayr; Mrs Thomas Sherriff, Dunbar; Peter Winton, Falkirk.
Reapers and Mowers.—The Beverley Iron Co., Beverley; Lillie, Goodlet, Elder, & Co., Berwick; M'Cutcheon & Sons, Edinburgh; Samuelson & Co., Banbury; James D. Allan & Sons, Dunkeld; Alex. Jack & Sons, Maybole; Kemp, Murray, & Nicholson, Stirling; J. & T. Young, Ayr; Bean & Sons, Stirling; John Bisset & Son, Blairgowrie; Brigham & Bickerton, Berwick; Haughton & Thompson, Carlisle; R. Hornsby & Sons, Grantham; John Wallace & Son, Glasgow; Thomas Wardlaw, Dunfermline; John Wingate, Alloa; Peter Winton, Falkirk.

Sheep Racks.—W. & J. Dodds, Haddington.
Steam Engines.—Ruston, Proctor, & Co., Lincoln; A. & J. Main & Co., Glasgow.
Thrashing Machine.—A. & J. Main & Co., Glasgow.
Turbine Wheel.—Williamson Brothers, Kendal.
Turnip Cleaner.—Thomas Hunter, Maybole.
Weighing Machines.—Heriot & Co., Glasgow; M'Cutcheon & Son, Edinburgh; Smith Brothers & Co., Glasgow; A. & W. Smith & Co., Glasgow.
Wood Working Machine.—Peter M'Intyre, Stirling.

LIST OF JUDGES.

Ayrshires.—Alexander Buchanan, Garscadden Mains, East Kilpatrick; John Macadam, Blairover, Drymen; James Pollock, Raws, Kilmarnock. Attending Members—Col. Carrick Buchanan, of Drumpellier; Hugh Kirkwood, Killermont.

Short-Horns.—John Grey, Lesswood House, Heydonbridge; Robert Hardie, Harrietfield, Kelso; Thomas Harris, Stoneylane, Broomsgrove. Attending Members—Charles M'Neill, Lossit; James Drennan, Holmston.

Polled.—George Brown, Westerton, Fochabers; John Graham, of Shaw, Lockerbie. Attending Members—Allan Gilmour, of Eaglesham; Robt. Guthrie, Crossburn.

Highland.—John Macfarlan, Faslane, Helensburgh; Donald Stewart, Achallader, Tyndrum; John Lorn Stewart, of Coll, Campbeltown. Attending Members—Capt. Campbell, of Glendaruel; James Mackechnie, Torren.

Fat Stock.—John Bell, 172 Argyle Street, Glasgow; James Geddes, Orbliston, Fochabers. Attending Members—James Campbell, of Tilliechewan; John Clark Forrest, Hamilton.

Stallions and Colts.—James Crawford, Thirdpart, Greenock; James Gulland, Tullygarth, Clackmannan; James Steedman, Boghall, Roslin. Attending Members—Sir Michael R. Shaw Stewart, Bart.; John Young, Fulwood.

Mares and Fillies.—John Curror, Comiston, Lothian Burn; Robert Findlay, Springhill, Baillieston, Glasgow. Attending Members—Col. Mure, of Caldwell; Robert Craig, Auchentiber.

Extra Horses.—Andrew Gillon, of Wallhouse, Bathgate; Alex. Kinloch, yr. of Gilmerton. Attending Members—Sir George Campbell, Bart.; Alex. Campbell, Crosshill.

Milk Cart Horses.—The Judges for Stallions and Colts.

Leicesters.—John H. Buckley, The Cottage, Loughbrough; Alexander Geekie, of Baldowrie, Coupar-Angus; William Smith, East Learmonth, Coldstream. Attending Members—Captain Speirs, of Elderslie, M.P.; James N. Fleming, Kiel.

Cheviots.—James Oliver, Howpasley, Hawick; Robert Paterson, Bighouse, Thurso. Attending Members—William W. Hozier, yr. of Mauldslie; Alexander Lang, Garnieland.

Blackfaced.—Robert Elliot, Laighwood, Dunkeld; William Moffat, Kinleith, Currie. Attending Members.—Sir Thomas Miles Riddell, Bart.; John MacArthur, Inverary.

Southdown, other Short Woolled, and Long Woolled other than Leicester.—John H. Buckley, The Cottage, Loughbrough; William Goodlet, Bolshan, Arbroath; Thomas Harris, Stoneylane, Broomsgrove. Attending Members—Alexander Bethune, of Blebo; Andrew Smith, Castle Mains.

Swine.—John Dudgeon, Almond hill, Kirkliston; D. B. Sadler, Balmuick, Crieff; Alex. Young, Keir Mains, Dunblane. Attending Members—John Gordon, of Aitkenhead; Robert M'Kean, Lumloch.

Poultry.—Richard Teebay, of Fulwood, Preston; James Wilson, Wester Cowden, Dalkeith. Attending Members—Thomas D. Findlay, Easterhill; Robert Pillans Newton, of Castlandhill; Stewart Souter Robertson, Hamilton Palace.

Dairy Produce.—James Fulton, 47 Argyle Street, Glasgow; Thomas Gibson, 93 Princes Street, Edinburgh. Attending Members—Alexander Graham, of Limekilns; John Colquhoun, Corkerhill.

Implements.—Professor Macquorn Rankine, Glasgow, Consulting Engineer to the Society; John Gibson, Woolmet, Dalkeith, Chairman of Machinery Committee; Alexander Slight, Practical Engineer; William Gray, Southfield, Duddingston, Edinburgh; Thomas Mylne, Niddrie Mains, Liberton; Archibald Russell, Flemington, Cambuslang; William Sadler, Ferrygate, Drem; James Steedman, Boghall, Roslin; James Wilson, Wester Cowden, Dalkeith.

III.—DISTRICT COMPETITIONS.

CATTLE.

The Islands of Shetland.

A grant of L.25 and a Silver Medal were given to the Shetland Agricultural Society. The Medal was awarded to John Bruce, yr. of Sumburgh, for best Bull.

The District of Annandale.

Bulls, Class II. ‡	John Graham, of Shaw, Lockerbie,	L.6	0 0
Heifers,	1. Robert Jardine, of Balgray, Lockerbie,	2	10 0*
	2. John Graham, of Shaw, Lockerbie,	1	10 0*

The Island of Skye.

Bulls,*	Nicol Martin, of Glendale, Dunvegan,	Silver Medal.	
Bulls, Class I. †	1. John Stewart, Duntulm, Portree,	L.7	0 0
	2. John Macleod, Monkstadt, Portree,	4	0 0
Bulls, Class II.	John Stewart, Duntulm, Portree,	3	0 0*
Heifers,	1. John Stewart, Duntulm, Portree,	5	0 0
	2. John Stewart, Duntulm, Portree,	3	0 0

The County of Elgin.

Bulls, Class I.	1. Alexander Paterson, Mulben, Keith,	L.3	10 0*
	2. James M'Kessack, Earnside, Forres,	2	0 0*
Heifers,	1. Alexander Paterson, Mulben, Keith,	5	0 0
	2. John Hunter, Dipple, Fochabers,	3	0 0

The County of Nairn.

Bulls,	Charles M'Kessack, Culblair, Ardersier,	Silver Medal.	
Bulls, Class I.	1. James M'Pherson, Drumore, Croy,	L.7	0 0
	2. John Andrews, Park, Nairn,	4	0 0
Bulls, Class II.	A. F. M'Lennan, Meikle Urchany, Nairn,	6	0 0
Heifers,	1. Robert Anderson, of Lochdhu, Nairn,	5	0 0
	2. James M'Kessack, Earnside, Forres,	3	0 0

* Half Premiums awarded, the number of lots being under six.
† Class I., Bulls calved before 1st January 1865.
‡ Class II., Bulls calved after 1st January 1865.

The County of Banff and District of Turriff.

Bulls,	Sir George Macpherson Grant, Bart.,	Silver Medal.		
Bulls, Class I.	1. Alex. Paterson, Mains of Mulben, Keith,	L.7	0	0
	2. J. Morrison, Auchlin, King Edward, Banff,	4	0	0
Bulls, Class II.	Andrew Longmore, Rettie, Banff,	3	0	0*
Heifers,	1. Charles Bruce, Broadland, Huntly,	5	0	0
	2. Andrew Longmore, Rettie, Banff,	3	0	0

The County of Kincardine.

Bulls,	H. Scott of Brotherton, Craigo House,	Silver Medal.		
Bulls, Class I.	1. John Milne, Anquherie, Stonehaven,	L.7	0	0
	2. William Alexander, Bent of Haulkerton, Laurencekirk,	4	0	0
Bulls, Class II.	George Stewart, Craigmoston, Fettercairn,	6	0	0
Heifers,	1. Robert Walker, Hillside House, Portlethen,	5	0	0
	2. Robert Walker, Hillside House, Portlethen,	3	0	0

The District of Formartine.

Bulls,	Major Ramsay of Barra, Straloch, Aberdeen,	Silver Medal.		
Bulls, Class I.	1. Alex. Ronaldson, Little Gight, Methlic,	L.7	0	0
	2. Gilbert Mitchell, Meikle Haddo, Foveran,	4	0	0
Bulls, Class II.	Amos Cruickshank, Sittyton, Aberdeen,	6	0	0
Heifers,	1. Amos Cruickshank, Sittyton, Aberdeen,	5	0	0
	2. Amos Cruickshank, Sittyton, Aberdeen,	3	0	0

DRAUGHT HORSES.

The District of Wester Ross.

Stallions,	Murdo Bethune, Dreim, Beauly,	L.25	0	0
Mares,	David Ross, Keppoch, Dingwall,	10	0	0
Fillies,	William Allan, Drummondreach, Ferrintosh,	5	0	0

The District of Perth, Fife, Kinross, and Clackmannan.

Stallions,	Andrew Logan, Crossflat, Kilbarchan,	L.25	0	0

ENTIRE COLTS.

The County of Linlithgow.

2-Year old Colts,	John Kerr, Bloom, Mid-Calder,	L.3	0	0*
1-Year old Colts,	James Brownlee, Holehouseburn, Whitburn	2	0	0*

The County of Edinburgh.

2-Year old Colts,	Trustees of the late John Finnie, Swanston,	L.3	0	0*
1-Year old Colts,	John Brown, Outerston, Gorebridge,	2	0	0*

LEICESTER SHEEP.

The District of the Border Union Society.

Tups,	Archibald Wotherspoon, Spotsmains, Kelso,	L.5	0	0
Shearling Tups,	William Purves, Linton Burnfoot, Kelso,	5	0	0
Shearling Ewes,	George Torrance, Sisterpath, Dunse,	2	0	0*

The County of Edinburgh.

Tups,	David Ainslie of Costerton, Blackshiels,	Silver Medal.		
Tups,	David Ainslie of Costerton, Blackshiels,	L.2	10	0*
Shearling Tups,	David Ainslie of Costerton, Blackshiels,	5	0	0
Ewes,	William Ford, Hardengreen, Dalkeith,	2	10	0*
Shearling Ewes,	David Ainslie of Costerton, Blackshiels,	2	0	0*

CHEVIOT SHEEP.

The District of West Teviotdale.

Tups, .	William Aitchison of Brieryhill, Hawick,	Silver Medal.	
Tups, .	William Aitchison of Brieryhill, Hawick, .	L.5	0 0
Shearling Tups,	John Moffat, Craik, Hawick, .	5	0 0
Ewes, .	John Moffat, Craik, Hawick, .	5	0 0
Shearling Ewes,	John Moffat, Craik, Hawick, .	4	0 0

The County of Peebles.

Tups, .	Sir G. Graham Montgomery, Bart., M.P.,	Silver Medal.	
Tups, .	James Johnstone, Capplegill, Moffat, .	L.5	0 0
Shearling Tups,	James Johnstone, Capplegill, Moffat, .	5	0 0
Ewes, .	A. Fox, Orchard Mains, Traquair, .	2	10 0*

The Pastoral District of Ross-shire.

Tups, .	Captain Davidson, Inverbroom, .	Silver Medal.	
Tups, .	Captain Davidson, Inverbroom, .	L.5	0 0
Shearling Tups,	Captain Davidson, Inverbroom, .	5	0 0
Ewes, .	Captain Davidson, Inverbroom, .	2	10 0*
Gimmers, .	Captain Davidson, Inverbroom, .	2	0 0*

The County of Sutherland.

Tups, .	E. Macivor, Scourie, Lairg, .	Silver Medal.	
Tups, .	William Mitchell, Ribigill, Tongue, .	L.5	0 0
Shearling Tups,	William Mitchell, Ribigill, Tongue, .	5	0 0
Ewes, .	William Mitchell, Ribigill, Tongue, .	5	0 0
Gimmers, .	William Mitchell, Ribigill, Tongue, .	4	0 0

BLACKFACED SHEEP.

The District of Lochaber.

Tups, .	Lord Abinger, Inverlochy Castle, Fort-William, .	Silver Medal.	
Tups, .	Charles Alexander, Meobile, Fort-William,	L.5	0 0
Shearling Tups,	Walter Reid, Glenfinnon, Fort-William, .	5	0 0
Ewes, .	Charles Alexander, Meobile, Fort-William,	2	10 0*
Gimmers, .	John M. Pender, Auchindawe, Fort-William,	2	0 0*

The District of Athole and Weem.

Tups, .	Sir Robert Menzies, of Menzies, Bart.,	Silver Medal.	
Tups, .	John Dickson, Calvine, Blair Athole, .	L5	0 0
Shearling Tups,	Robert Peter, Urlar, Aberfeldy, .	2	10 0*
Ewes, .	John Dickson, Calvine, Blair Athole, .	2	10 0*
Gimmers, .	John Dickson, Calvine, Blair Athole, .	4	0 0

The District of Badenoch.

Tups, .	C. T. Pelham, Etteridge, Kingussie, .	L.5	0 0
Shearling Tups,	Allan Kennedy, Kinchile, Aviemore, .	5	0 0
Ewes, .	J. Macpherson, Killihuntly, Kingussie, .	2	10 0*
Gimmers, .	Messrs Macdonald, Strathmashie, Laggan,	4	0 0

SWINE.

The District of Dalkeith.

Boars, .	Viscount Melville, Melville Castle,	Silver Medal.	
Boars, .	1. James Stenhouse, Myles, Tranent, .	L.4	0 0
	2. William Bertram Brown, Smeaton, Dalkeith,	2	0 0
Sows, .	1. George Smith, Chalkieside, Dalkeith, .	3	0 0
	2. James Wilson, Wester Cowden, Dalkeith,	1	0 0

DAIRY PRODUCE.

The Western District of Mid-Lothian.

CURED BUTTER, . 1. James Walker, Tippethill, Bathgate, . L.3 0 0
2. William Meikle, East Breich, West Calder, 2 0 0

The District of Kilmarnock.

Medium Gold Medals were awarded to :—

1. Matthew Hannah, Aird, Inch, Stranraer, for Sweet Milk Cheese (Cheddar variety).
2. George Dunlop, Warwickland, Fenwick, for Sweet Milk Cheese (Dunlop variety).

SEED COMPETITIONS.

Silver Medals were awarded to the following :—

The County of Ayr.

Robert Guthrie, Crossburn, Troon, for Archer's Prolific Wheat.
Alexander M'Vicar, New Mill, Kilmarnock, for Chevalier Barley.
Thomas Bone, East Sanquhar, St Quivox, for Sheriff's Improved Oats.
James Pollock, Raws, Kilmarnock, for Perennial Ryegrass.

The County of Stirling.

Alexander Buchanan, Whitehouse, Stirling, for Trump Wheat.
John Blair, Clayhills, Stirling, for Scotch Barley.
Thomas Murdoch, Blairdrummond, Stirling, for Early Blainslie Oats.
Robert Downie, Hillhead, Stirling, for Scotch Beans.

The District of Wester Ross.

William Allan, Drummondreach, Dingwall, for White Essex Wheat.

The District of the Black Isle.

Major Wardlaw, Belmaduthy, Munlochy, for Potato Oats.

The County of Caithness.

John Scott, Noss, Wick, for Buchan Bere.
George Brock, West Greenland, Castleton, Thurso, for Sandy Oats.

The Islands of Shetland.

John Walker, Maryfield, Lerwick, for Early Angus Oats.

The District of Spey, Avon, and Fiddochside.

James M'Pherson, Pitcroy, Ballindalloch, for Golden Melon Barley.
James M'Pherson, Pitcroy, Ballindalloch, for Scotch Birlie Oats.

The District of Strathearn.

John Whyte, Muirhead, Dunning, for Potato Oats.

The District of Strathspey.

James Stephen, Kinchardy, Aviemore, for Common English Barley.
Charles Grant, Advie, Craigellachie, for Early Angus Oats.

The County of Elgin.

Lewis Smith, Milton of Grange, Forres, for Wheat.
James Smith, Middlefield of Inverne, Forres, for Chevalier Barley.
Alexander Paterson, Mulben, Keith, for Potato Oats.
John Adam, Easterton, Birnie, Elgin, for Perennial Ryegrass.

PLOUGHING COMPETITIONS.

In the course of the year 1866–1867 the Society's Medal was awarded at 149 Ploughing Competitions—the details of which are given at p. 68.

MEDALS IN AID OF PREMIUMS GIVEN BY LOCAL SOCIETIES.

Silver Medals were awarded to the following :—

The District of the Ardrossan Farmers' Society.

Alexander Young, Yondertown, West Kilbride, for best Sweet Milk Cheese.
Hugh Smith, Lochcraigs, Stevenston, for best Cured Butter.

The District of the Black Isle.

James Cameron, Balnakyle, Munlochy, Inverness, for best Shorthorn Bull.

The Parish of Broughton.

James Merrylees, Culter, Biggar, for best Butter.

The District of Buchan.

James Bruce, Inverquhomerie, Longside, for best Shorthorn Bull.
James Bruce, Inverquhomerie, Longside, for best Shorthorn Cow.

The Island of Bute.

Robert Macfie, Ettrick, Rothesay, for best managed Green Crop.

The County of Caithness.

James Henderson of Bilbster, Wick, for best Shorthorn Bull.
Sir George Dunbar, Bart., Ackergill Tower, Wick, for best Highland Cow.

The District of Carrick.

James Nicol Fleming of Knockdon, for best managed Green Crop.

The County of Clackmannan.

Andrew and Alexander Mitchell, Alloa, for best managed Green Crop—Dryfield Farm.
William Menzies, Burnbrae, Kincardine, for best managed Green Crop—Carse Farm.
William Allan, Park, Clackmannan, for best made Hay.

The District of the Cluny Association.

William Downie, Linton Mains, Cluny, for best Shorthorn Bull.
Colonel Fraser of Castle Fraser, Aberdeen, for best Shorthorn Cow.
Henry Downie, Balvack, Monymusk, for best managed Farm.
Robert Adam, Todlachie, Monymusk, for best managed Green Crop.

The District of Cumnock.

Mrs Stewart, Dalleagles, New Cumnock, for best Sweet Milk Cheese.
Mrs Wallace, Piperhill, Ochiltree, for best Cured Butter.
James Wilson, Oldmill, New Cumnock, for best Collection of Roots.
John Wilson, Laigh Tarbeg, Ochiltree, for best Collection of Seeds.

The District of Donside.

George Thomson of Pitmedden, Aberdeen, for best managed Green Crop.

County of Elgin.

John Hunter, Dipple, Fochabers, for Swedish Turnips.
John Hunter, Dipple, Fochabers, for Regent Potatoes.

The District of Fettercairn.

William Alexander, Bent of Halkerton, Laurencekirk, for best Shorthorn Bull.
Charles Middleton, Nether Thainstone, Fettercairn, for best Polled Cow.
David Mitchell, Lower Powburn, Fordoun, for best managed Green Crop.

The County of Kincardine.

David Mitchell, Lower Powburn, Fordoun, for best managed Green Crop.

The District of Leochel-Cushnie.

James Emslie, Cardenstone, Alford, for best Polled Aberdeen Bull.
Hary Shaw, Bogfern, Tarland, for best Polled Aberdeen Cow.
Charles Strachan, Tillyoarn, Corse, for best managed Green Crop.

The District of Mauchline.

Robert Caldwell, Knockshoggle, Coylton, for best managed Dairy.

The District of Nithsdale.

William Borland, Townfoot, Thornhill, for best Sweet Milk Cheese.
William Irving, Barndannock, Auldgarth, for best Cured Butter.

The District of Penicuik.

Andrew Pate, Fulford, Roslin, for best Ayrshire Bull.
James Wilson, Wester Cowden, Dalkeith, for best Clydesdale Mare.

The District of Spey, Avon, and Fiddochside.

Sir George Macpherson Grant of Ballindalloch, Bart., for best Polled Bull.
William Cantlie, Keithmore, Dufftown, for best Shorthorn Heifer.
John Fleming, Marionburgh, Ballindalloch, for best managed Farm.
Sir George Macpherson Grant, Bart., for best managed Green Crop.

The District of Stewarton.

James Nisbet, Gameshill, Dunlop, for best Sweet Milk Cheese.

The Islands of Shetland.

James Jaffray, Belmont, Unst, for best Cured Butter.

The District of West Linton.

Miss Flora Inch, Wester Deanshouses, Leadburn, for best Sweet Milk Cheese.
Peter Wilson, Noblehall, Noblehouse, for best Cured Butter.

The Western District of Mid-Lothian.

James Young, Bormie, Linlithgow, for best Ayrshire Bull.
William Aitken, Chapel, Wishaw, for best Clydesdale Mare.

The District of Wester Ross.

John Gordon, Braelangwell, Tain, for best Shorthorn Bull.
John Hendrie, Castle Heather, Inverness, for best Mare.

Forres Fat Show.

Walter Scott, Glendronach, Huntly, for best Bullock.
Robert Bruce, Johnston, Leslie, Aberdeen, for best Heifer.
John Ferguson, East Grange, Forres, for best pen of Sheep.
Robert Munro, Covsea, Elgin, for best Pig.

Edinburgh Christmas Club.

Amount of Vote in Aid of Premiums, ... £50 0 0

Dundee Show.

Amount of Vote in Aid of Premiums, ... £100 0 0

IV. COTTAGES AND GARDENS.

FOR THE BEST-KEPT COTTAGES AND GARDENS.

First Cottage Premium, L.1, 5s., and Medal when Four Competitors; Second, L.1; Third, 15s. First Garden Premium, L.1, 5s., and Medal when Four Competitors; Second, L.1; Third, 15s.

Parish of Birse.—1*st* Cottage Premium and Medal, John Collie; 2*d*, Alexander Bowman; 3*d*, David Strachan. 1*st* Garden Premium and Medal, David Strachan; 2*d*, Alexander Bowman; 3*d*, George Birss. Medal to John Collie, awarded 1*st* Premium in 1865.

Parishes of Lonmay and Crimond.—1*st* Cottage Premium and Medal, Andrew Jaffray; 2*d*, William Clubb; 3*d*, Alexandar Sinclair. 1*st* Garden Premium and Medal, R. Ritchie; 2*d*, Wm. Hutcheon; 3*d*, James Ewerdine.

Balerno.—1*st* Garden Premium and Medal, James Bryce; 2*d*, George Heriot; 3*d*, Walter Knox.

Parish of Forgandenny.—1*st* Garden Premium and Medal, James Anderson; 2*d*, Thomas M'Ewan; 3*d*, John Richardson.

Parish of Abernethy.—1*st* Garden Premium and Medal, John Sandilands; 2*d*, John Bain; 3*d*, James Paterson.

Parish of Gask.—1*st* Cottage Premium and Medal, Janet Monteith; 2*d*, David Gilbert; 3*d*, Mary Rae. 1*st* Garden Premium and Medal, Hector Drysdale; 2*d*, Alexander Moncrieff; 3*d*, James Kemp.

MEDALS IN AID OF PRIVATE COMPETITIONS.

Ballindalloch.—Alexander Cameron, for best kept Cottage.

Cromar.—James Skeen, for best kept Cottage Garden.

Breadalbane, &c.—William Stewart, for best kept Garden.

Breadalbane, &c. (Amateurs.)—Chas. M'Diarmid, for best kept Garden.

West Linton.—William Rae, for best kept Cottage and Garden.

Culross.—James Bryce, for best kept Cottage Garden.

Logiealmond, &c.—Duncan M'Nab, for best kept Garden.

Hutchesonton Gardens.—Robert Boness, Glasgow, for best kept Plot.

Victoria Gardens, Govanhill.—James Duncan, Glasgow, for best kept Plot.

V. VETERINARY COLLEGE.

Silver Medals were awarded, at the Annual Examination in April last, to the following:—

1. A. G. Rolls, Weymouth, for best Examination in Horse Pathology.
2. Do. do. for best Examination in Anatomy.
3. Do. do. for best Examination in Physiology.
4. Do. do. for best Examination in Materia Medica.
5. R. C. Edwards, Derby, for best Examination in Chemistry.
6. Do. do. for best Examination in Cattle Pathology.
7. P. M. Walker, Luss, for best General Examination.

VI. AGRICULTURAL CLASS, EDINBURGH UNIVERSITY.

The Prizes of £6 and £4, annually allowed by the Society to the Students who pass the best and second best examinations in the Agricultural Class in the University of Edinburgh, were awarded in 1867 to,—

1*st*, Richard George Scriven, Northamptonshire.

2*d*, Robert Brydon, Burncastle, Berwickshire.

RETURNS OF SEEDS COMPETITIONS HELD IN 1867.

Districts.	Seed exhibited in Competition by Growers to whom Silver Medals were awarded.		Number of Competitors.	Competitors to whom Silver Medals were Adjudged.		Produce per Imperial Acre.	Weight per Bushel.	Date of Sowing.	Date of Reaping.	Ground on which the Prize Seed was Grown.		
	Name of Species and Varieties.	Quantity.		Christian Name and Surname.	Estate or Farm, and Post Town.					Altitude.	Exposure.	Nature of Soil.
		Qrs.				Qrs.	Lbs.			Feet.		
1867. AYRSHIRE, Oct. 31	Wheat (Archer's prolific)	2	2	Robert Guthrie . .	Crossburn, Troon .	4	62½	Jan. , 1867	Sept. 7, 1867	50	S.	Sharp good soil.
	Chevalier barley . .	2	4	Alexander M'Vicar .	New Mill, Kilmarnock . . .	8	58	Apr. 17 ,,	Sept. 28 ,,	20	Flat.	Good sandy holm land.
	Oats (Shirreff's improved)	2	2	Thomas Bone . . .	East Sanquhar, St Quivox . . .	7¼	43	Apr. 12 ,,	Sept. 13 ,,	41	S.W.	Light loam.
	Perennial ryegrass . .	2	2	James Pollock . .	Raws, Kilmarnock	3½	28	Apr. 15 ,,	July 15 ,,	290	N.W.	Clay medium.
STIRLING, March 15 and Oct. 25	Scotch barley	3	6	John Blair	Clayhills, Stirling	6	55¼	Apr. 10 ,,	Aug. 27 ,,	150	N.	Dryfield—sandy.
	Oats (Blainslie early) .	3	13	Thomas Murdoch .	Blair Drummond, Stirling . .	6	43½	Apr. 1 ,,	Sept. 10 ,,	10	S.	Clayey.
	Scotch beans	3	2	Robert Downie . .	Hillhead, Stirling .	7	65½	Mar. 15 ,,	Sept. 23 ,,	15	S.	Clayey.
	Trump wheat	3	8	Alexander Buchanan	Whitehouse, Stirling	3½	62	Nov. 11, 1866	Sept. 23 ,,	50	Flat.	Carse.
BLACK ISLE, March 7	Potato oats	3	3	Major Wardlaw . .	Belmaduthy, Munlochy	5	44½	Apr. 4 ,,	Sept. 8, 1866	430	S.	Black loam and sand.
CAITHNESS, Feb. 22	Buchan bere	3	3	John Scott	Noss, Wick . . .	5	54	May 5 ,,	Sept. 11 ,,	102	N.	Light loam.
	Sandy oats	3	4	George Brock . . .	West Greenland, Thurso	5½	43	Apr. 11 ,,	Sept. 13 ,,	100	N.E.	Sandy loam.
SHETLAND, Feb. 26.	Early Angus oats . .	3	11	John Walker . . .	Maryfield, Lerwick	6	43½	Apr. 16 ,,	Sept. 18 ,,	20	S.W.	Light loam.
SPEY, AVON, &c., Mar. 5.	Barley (golden melon)	3	5	James M'Pherson .	Piteroy, Ballindalloch	5¾	57½	Apr. 21 ,,	Sept. 12 ,,	...	S.	Light sand, gravel, and loam.
	Oats (Scotch birlie) . .	3	6	James M'Pherson .	Piteroy, Ballindalloch	5⅜	45	Apr. 14 ,,	Sept. 19 ,,	...	S.	Hard thin soil.
STRATHEARN, Feb. 21.	Potato Oats	3	7	John White . . .	Muirhead, Dunning	4	45	Apr. 3 ,,	Aug. 21 ,,	140	N.	Sandy.
STRATHSPEY, March 12.	Common English barley	3	6	James Stephen . .	Kinchurdy, Aviemore	3	57¾	Apr. 24 ,,	Aug. 28 ,,	800	S.	Light sandyloam.
	Early Angus oats . .	3	4	Charles Grant . .	Advie	4	44	Apr. 12 ,,	Sept. 1 ,,	600	N.	Heavy clay.
ELGIN, Feb. 1.	Wheat	3	4	Lewis Smith . . .	Milton of Grange, Forres	5	64½	Oct. 12, 1865	Sept. ,,	4	N.	Loam and sand.
	Chevalier barley . . .	3	5	James Smith . . .	Middlefield of Inverne, Forres .	5	58½	May 15, 1866	Sept. ,,	6	S & W.	Medium.
	Potato oats	3	3	Alexander Paterson	Mulben. Keith . .	4½	44¾	Apr. 20 ,,	Sept. 11 ,,	400	S.	Black loam.
	Perennial ryegrass . .	2	4	John Adam . . .	Westerton, Birnie, Elgin	4	32	May 1, 1865	July ,,	100	E.	Mossy, with sand.
DINGWALL, Oct. 19.	White Essex wheat. .	2	3	William Allan . . .	Drummondriach .	4	62	Nov. 15, 1866	Sep. 15, 1867	100	N.	Light loam.

PLOUGHING COMPETITIONS REPORTED TO THE SOCIETY IN 1866-67.

No.	Name of Society.	Place of Competition.	Date.	No. of Ploughs.	Extent.	Time.	Amount of Premiums. £ s. d.	First Premium and Silver Medal Awarded to
	ABERDEENSHIRE—							
1	Alford,	Breda,	Dec. 26, 1866	42	½ acre	5 hours	4 0 0	James White, Tillyfour.
2	Ballater,	Eastfield,	Dec. 14, 1866	18	⅕ acre	5 hours	3 11 6	Joseph Coutts, Ballater.
3	Buchan (Deer District),	Lunderton,	Dec. 27, 1866	49	⅕ acre	5 hours	4 12 6	George Watson, Outhill of Bora.
4	Coldstone and Migvie,	Hopewell and Migvie,	Dec. 21, 1866	31	47 poles	4 hours	4 3 0	John Farquharson, Galton.
5	Countesswells,	Reeketlean,	Dec. 11, 1866	19	1 rood 18 poles	4¾ hours	4 2 0	William Dawson, Wardhead.
6	Crathie,	Abergeldie,	Feb. 21, 1867	22	2 roods 5 poles	5½ hours	4 7 6	James Morrison, Invergeldie.
7	Dyce,	Pitmedden,	Dec. 25, 1866	16	1 rood 31 poles	4½ hours	3 0 0	Peter Duncan, Glen of Dyce.
8	Forbes and Fordyce,	Killiequharrn,	Dec. 27, 1866	30	⅕ acre	4 hours	3 0 0	William King, Ardlaw.
9	Inch,	Headtown,	Dec. 20, 1866	31	1 rood 14 poles	3 hs. 20 ms.	4 7 6	George Meldrum, Dunnydeer.
10	Kennethmont,	Leith Hall,	Dec. 14, 1866	26	⅕ acre	4 hours	3 0 0	James Robson, Newton Hill.
11	Mar,	Auchronie,	Dec. 26, 1866	66	⅕ acre	4½ hours	3 6 6	Alexander Reith, Greenburn.
12	Newhills,	Sheddocksley,	Dec. 13, 1866	21	66 poles	5½ hours	3 0 6	John Dawson, Walton.
13	Strichen,	Banks,	Feb. 4, 1867	42	⅕ acre	4 hs. 20 ms.	3 0 6	John Bruce, Mains of Kindrought.
14	Old Machar,	Upper Bodachra,	Dec. 19, 1866	25	1 rood 24 poles	5 hours	5 5 0	James Dugnid, Denmore.
	ARGYLLSHIRE—							
15	Glenorchy,	Dalmally,	Mar. 20, 1867	16	½ acre	5 hours	3 5 0	James Brown, Edindonich.
16	Inverary,	Maam,	Mar. 29, 1867	15	7-10th acre	7 hours	3 6 0	John Gillespie, Clachan.
17	Kilfinan,	Invereen,	Feb. 12, 1867	19	1 rood 36 poles	5 hours	3 7 6	Alexander Maconnel, Point Farm.
18	Killean and Kilkenzie,	Claonigart,	Feb. 14, 1867	22	⅕ acre	5 hours	3 3 0	John M'Queston, Glenechara.
19	Kilmartin,	Fernoch,	Feb. 11, 1867	19	½ acre	5 hours	3 16 0	David Kilpatrick, Drimvore.
20	Kintyre,	Kileonan,	Feb. 1, 1867	31	⅓ acre	5 hours	4 14 6	Andrew Ronald, Brunerican.
21	Lorn,	Sauhnore,	Feb. 20, 1867	15	⅕ acre	8 hours	3 0 0	Angus Campbell, Soroba.
22	Netherlorn,	Ardnahua,	Mar. 1, 1867	15	⅕ acre	6 hours	4 2 0	Dugald M'Callum, Duachy.
	AYRSHIRE—							
23	Ayr,	Mount Fergusson,	Jan. 31, 1867	17	Rate of 1 acre	16 hours	3 18 6	James Aird, South Corton.
24	Ardrossan,	Braid Farm,	Feb. 14, 1867	25	1 rood	4 hours	3 10 0	Ebenezer Speir, Boydstone.
25	Cumnock,	Knockterror,	Feb. 7, 1867	15	1 rood 30 poles	4½ hours	4 3 6	John M'Gill, Braes.
26	Cumnock, New,	Loch Hill,	Feb. 2, 1867	19	Rate of 1 acre	16 hours	3 19 6	George Welsh, Hall.
27	Fenwick,	Meiklewood,	Feb. 5, 1867	17	Rate of 1 acre	16 hours	4 10 0	James Kelly, Marchhank.
28	Gougar,	Gougar Mains,	Feb. 28, 1867	17	Rate of 1 acre	14 hours	3 17 6	William Fleming, Rushaw.
29	Kilmarnock,	Bonnyton,	Feb. 1, 1867	24	⅔ acre	5 hs. 40 ms.	4 18 0	William Wyllie, Mossgiel.
30	Kirkmichael,	Drumore,	Feb. 2, 1867	29	40 falls	4 hours	3 0 0	James M'Kie, Drumore.
31	Mauchline,	Hollybush,	Feb. 5. 1867	19	Rate of 1 acre	14 hours	3 19 0	John M'Gregor, Moor.
32	St. Quivox,	Strath Sanquhar,	Feb. 2, 1867	17	89 poles	7 hours	4 7 6	John Smith, Mossblown.
33	Sorn and Dalgain,	Westtown,	Feb. 2, 1867	18	1 rood	3½ hours	3 10 0	John Morrison, Hillhead.
34	Stair and Coylton,	Lane,	Mar. 8, 1867	17	½ acre	4⅘ hours	4 5 6	John Auld, Pettock.
35	Straiton,	Bennan,	Feb. 20, 1867	16	⅕ acre	5 hours	3 3 0	Thomas Gairie, Burnton.
36	Tarbolton,	Strandhead,	Feb. 7, 1867	28	1½ rood	5 hours	3 12 6	William Glover, Fail Mill.
37	West Kilbride,	Lawoodhead,	Feb. 18, 1867	33	Rate of 1 Sc. acre	16 hours	0 0	Francis M'Allan, Kirkland.

PLOUGHING COMPETITIONS REPORTED TO THE SOCIETY IN 1866-67—*Continued.*

No.	Name of Society.	Place of Competition.	Date.	No. of Ploughs.	Extent.	Time.	Amount of Premiums. £ s. d.	First Premium and Silver Medal Awarded to
	BANFFSHIRE—							
38	Keith,	Ardrone,	Feb. 13, 1867	30	½ acre	5 hours	7 10 0	James Weir, Yonderton.
39	Spey, Avon, and Fiddochside,	Ballindalloch,	Dec. 12, 1866	36	⅛ acre	5½ hours	3 18 6	Alexander Cruickshank, Tullochallum.
	BERWICKSHIRE—							
40	Border Union,	Eccles Tofts,	Feb. 7, 1867	44	⅜ acre	7½ hours	10 5 0	George Mullans, Marchelcugh.
41	Chirnside,	Causeway Bank,	Dec. 22, 1866	22	¼ acre	5 hours	3 15 0	Robert Middlemass, Old Castles.
42	Cockburnspath,	Eccle,	Dec. 24, 1866	27	3-5th acre	6½ hours	4 8 0	George Cockburn, Whiteburn.
43	Coldstream,	Lennel Hill,	Feb. 12, 1867	23	⅜ acre	6 hours	7 10 0	Andrew Nairn, Strathmuir.
44	Dunse,	Rules Mains,	Dec. 28, 1866	21	5-8th acre	8 hours	7 17 6	William Burns, Chapel.
45	Eccles,	Lambden,	Dec. 20, 1866	31	⅜ acre	7 hours	5 0 0	Alexander Dawson, Stonefold.
46	Gordon,	Huntlywood,	Feb. 2, 1867	24	⅜ acre	7 hours	6 7 6	Alexander Galbraith, Greenknowe.
47	Lammermuir,	Bankend,	Dec. 27, 1866	20	3-5th acre	6 hours	3 0 0	Alexander Gibson, Godscroft.
48	Lauderdale,	Inglestone,	Feb. 2, 1867	21	⅝ acre	6 hours	4 9 6	William Thomson, Hindside Hill.
49	Legerwood,	Birkenside,	Dec. 20, 1866	26	acre	6 hours	3 12 6	Thomas Halliday, West Morriston.
50	Westruther,	Spottiswoode,	Dec. 29, 1866	27	3-4th acre	6 hs. 20 ms.	4 11 6	Alexander Galbraith, Bassendean.
	BUTE & ARRAN—							
51	Arran,	Bennecarrigan,	Feb. 6, 1867	35	1 acre	18 hours	5 18 0	Hector M'Allister, jun., Glaister.
52	Bute,	Kilmory,	Feb. 15, 1867	37	1 rood	4 hours	7 19 0	William M'Intyre, Kerrycroy.
	CAITHNESS-SHIRE—							
53	Caithness,	Stanstill,	Mar. 7, 1867	63	½ acre	5 hours	4 17 6	Hugh Munro, East Murkle.
	DUMBARTONSHIRE—							
54	Cardross,	Walton,	Feb. 8, 1867	20	Rate of 1 acre	14 hours	5 10 0	John Colquhoun, Kilmahew.
55	Kilmaronock and Bonhill,	Woodside,	Feb. 5, 1867	16	½ acre	5 hours	5 5 0	John Buchanan, Croftfoot.
56	Kirkintilloch,	Wallflat,	Feb. 7, 1867	16	Rate of 1 acre	12 hours	3 5 0	George Henderson, Hayston.
	DUMFRIESSHIRE—							
57	Penpont,	Kirkland,	Feb. 8, 1867	27	⅛ acre	5 hours	7 8 0	Robert M'Vinnie, Nether Keir.
58	Springkell,	Bectonhall,	Jan. 29, 1867	18	⅛ acre	5 hours	3 17 6	James Marshall, Parkhouse.
59	Tinwald,	South Cowshaw,	Dec. 31, 1866	24	⅛ acre	6 hours	5 7 6	Walter Lockerbie, Tinwald Shaws.
60	Upper Annandale,	Kirkhill,	Feb. 5, 1867	16	⅛ acre	5½ hours	5 7 6	James Burgess, Annanbank.
61	Wester Kirk,	Mid-Knock,	Feb. 15, 1867	18	⅛ acre	5 hours	4 17 0	William Gordon, Mill Holm.
	EDINBURGHSHIRE—							
62	Borthwick,	Castleton,	Dec. 24, 1866	34	Rate of 1 acre	10 hours	4 10 0	Philip Leadbitter, Arniston Main3.
63	Calder, West,	Rusha,	Jan. 31, 1867	15	⅛ acre	6 hours	3 16 0	James Allison, Parkhead.
64	Carrington and Whitehill,	Redside,	Dec. 28, 1866	40	⅛ acre	5 hours	5 11 0	James Black, Roslinlee.
65	Cockpen and Newbattle,	Wester Cowden,	Dec. 21, 1866	39	⅛ Scotch acre	7 hours	6 13 6	William Hunter, Wester Cowden.
66	Currie,	Malleny,	Dec. 21, 1866	37	⅜ acre	7½ hours	3 15 0	James Gilbert, Riccarton Mains.
67	Lasswade,	Melville Mains,	Dec. 14, 1866	39	⅛ acre	5 hours	5 19 0	Alexander Pedan, Fulford.
68	Newton,	Sheriff Hall Mains,	Feb. 8, 1867	22	½ acre	7 hours	3 11 6	Thomas Cleghorn, Craigour.
69	Temple,	Mauldslie,	Dec. 28, 1866	31	⅛ acre	6 hours	3 11 6	George Denholm, Yorkston.

PLOUGHING COMPETITIONS REPORTED TO THE SOCIETY IN 1866-67—*Continued.*

No.	Name of Society.	Place of Competition.	Date.	No. of Ploughs.	Extent.	Time.	Amount of Premiums.	First Premium and Silver Medal Awarded to
	ELGINSHIRE—							
70	Kirdels and Knockando,	Kirdelbeg,	Dec. 29, 1866	22	½ acre	5½ hours	3 5 0	Charles M'Kerrow, Mains of Knockando.
71	Urquhart,	Stonewells,	Feb. 28, 1867	33	½ acre	4 hours	3 7 0	James Cramond, Innismill.
	FIFESHIRE—							
72	Auchtermuchty,	Shields,	Feb. 7, 1867	29	½ acre	5 hours	3 3 0	John Kirk, Wellfield.
73	Crossgates,	Hill of Beath,	Dec. 14, 1866	35	½ acre	5 hours	3 10 6	George Blyth, Keirsbeath.
74	Dunnikier,	Torbain,	Feb. 8, 1867	31	⅝ Scotch acre	6½ hours	3 16 0	Andrew Lumsden, Mutton Hall.
75	Dysart,	Newton of Wemyss,	Jan. 31, 1867	39	½ acre	5 hours	3 15 0	Thomas Cairns, Spittal.
76	Largo,	Lahill,	Feb. 13, 1867	22	½ acre	5 hours	3 12 6	Henry Dalrymple, Little Balcormo
77	Leslie,	Macedonia,	Dec. 25, 1866	35	½ acre	5 hours	3 16 0	George Galloway, Mildeans.
	FORFARSHIRE—							
78	Tannadyce and Oathlaw,	Finhaven Haughs,	Dec. 27, 1866	46	½ acre	5 hours	3 19 0	John Walker, Muiryhillock.
	HADDINGTONSHIRE—							
79	Dunbar, Spott, & Innerwick,	Meikle Pinkerton,	Dec. 20, 1866	32	½ acre	5 hours	3 15 0	William Slight, Pathhead.
	INVERNESS-SHIRE—							
80	Inverness,	Stoneyfield,	Dec. 27, 1866	55	½ acre	5 hours	7 14 0	Alexander Falconer, Balspender.
81	Glen Urquhart,	Drumnadrochit,	Feb. 7, 1867	19	½ acre	5 hours	3 0 0	Donald Fraser, Drumbuie.
82	Lews,	Coll, Island of Lews,	Feb. 19, 1867	15	⅜ acre	7 hours	3 2 6	William Naughton, Holm.
83	Strathdearn,	Tomatin,	Mar. 28, 1867	17	½ acre	5 hours	5 2 0	Michael Smith, Moyhall.
84	Strathspey,	Mains of Gartine,	Apr. 2, 1867	27	⅓ acre	4½ hours	3 1 6	Francis Grant, Tombea.
	KINCARDINESHIRE—							
85	Durris,	Westerton,	Dec. 19, 1866	47	½ acre	3½ hours	6 5 0	Charles M'Hardy, Cairnfauld.
86	Elsick,	Mains of Newhall,	Dec. 31, 1866	25	½ acre	6 hours	5 12 6	Alexander Mutch, Mains of Newhall.
87	Glenbervie,	Gyratsmyre,	Dec. 22, 1866	66	1 rood 16 poles	3½ hours	3 10 0	David Robertson, Nether Powburn.
88	Netherley,	Borrowfield of Rickarton,	Dec. 18, 1866	24	Rate of ½ acre	5 hours	3 17 0	Francis Smith, Monquick.
89	Nigg,	Balnagask,	Dec. 18, 1866	33	½ acre	5 hours	7 15 6	Alexander Robb, Balnagask.
90	Portlethen,	Blackhills of Cairnrobin,	Dec. 25, 1866	32	Rate of ½ acre	5 hours	5 19 6	Robert Milne, Cairnrobin.
91	Rickarton and Ury,	Newbigging,	Dec. 4, 1866	32	½ acre	3½ hours	9 14 6	George Dunbar, Glenton.
	KINROSS-SHIRE—							
92	Fossoway and Aldie,	Borcland of Cleish,	Feb. 2, 1867	15	½ acre	5 hours	3 0 0	Mathew Foulis, Threapmuir.
	KIRKCUDBRIGHT—							
93	Glenkens,	Dalarran,	Feb. 14, 1867	35	1 rood	2½ hours	4 7 6	John Thomson, Troquhain.
94	New Abbey,	Overton,	Feb. 8, 1867	20	2-5th acre	4 hours	6 0 0	James Jardine, Lochhill.
95	Penningham, Minnigaff, &c.,	Muirfad,	Feb. 2, 1867	24	½ acre	5 hours	5 10 0	Alexander Parker, Carslae.

PLOUGHING COMPETITIONS REPORTED TO THE SOCIETY IN 1866-67—*Continued.*

No.	Name of Society.	Place of Competition.	Date.	No. of Ploughs.	Extent.	Time.	Amount of Premiums. £ s. d.	First Premium and Silver Medal Awarded to
	LANARKSHIRE—							
96	Biggar and Skirling,	Boghall,	Dec. 14, 1866	28	½ acre	8½ hours	7 2 6	Benjamin Mundell, Edmonston Townhead.
97	Cadder,	Cadder Cult,	Feb. 5, 1867	37	Rate of 1 acre	10 hours	10 0 0	John Gilchrist, Park.
98	Carmichael & Douglas Water,	Millmoor,	Feb. 4, 1867	15	1 rood 35 poles	5 hs. 25 ms.	5 15 0	Thomas Tweedie, Harperfield.
99	Culter,	Wolf Clyde,	Feb. 1, 1867	16	1½ rood	6 hours	5 11 0	James Dempster, Easter Place.
100	Liberton,	Cormiston Mains,	Dec. 19, 1866	25	½ acre	5 hours	4 10 0	John Ritchie, junior, Whitecastle.
101	Old Monkland,	Easterhouse,	Feb. 1, 1867	25	½ acre	7 hours	5 5 0	Alexander Steel, Heathery Knowe.
102	Wiston and Roberton,	Moat,	Feb. 5, 1867	15	½ acre	6 hours	4 10 6	John Forrest, Eastfield.
	LINLITHGOWSHIRE—							
103	West. Dist. of Mid-Lothian,	Dechmont,	Feb. 8, 1867	28	⅛ Scotch acre	7½ hours	5 0 0	John Cameron, Deans.
104	Kinnell,	Rousland,	Dec. 24, 1866	33	⅛ acre	6 hours	7 0 0	George Strathy, Inveravon.
105	West Lothian,	Bo'ness Mains,	Dec. 22, 1866	28	½ acre	6¾ hours	5 7 6	John Taylor, Woodcockdale.
	NAIRNSHIRE—							
106	Nairnshire,	Park, Auldearn,	Feb. 2, 1867	59	½ acre	5 hours	3 17 6	Alexander M'Andrew, Auchendown.
	ORKNEY—							
107	West Mainland,	Deepdale,	Feb. 22, 1867	18	1 rood 36 poles	5 hours	4 7 0	William Mutch, Quholmslie.
	PEEBLESSHIRE—							
108	Manor,	Kirkton Mill,	Feb. 1, 1867	17	2 roods 8 poles	5½ hours	4 13 0	William Lawson, Woodhouse.
109	Kibbochy,	Kibbochy Mains,	Feb. 26, 1867	18	½ Scotch acre	7 hours	6 0 0	Robert Gilroy, Bamflatt.
	PERTHSHIRE—							
110	Alyth and Airlie,	Kirklandbank,	Dec. 20, 1866	43	½ acre	5 hours	5 5 0	David Whytoch, Grange of Airlie.
111	Ardoch,	Townhead,	Mar. 6, 1867	26	½ acre	5 hours	3 0 6	John Sands, Glenbank.
112	Auchterarder,	Easter Coul,	Feb. 6, 1867	18	½ acre	5 hs. 9 ms.	3 1 0	David Boswell, Kirkton.
113	Breadalbane and Glenlyon,	Acharn,	Mar. 29, 1867	17	1 rood 20 poles	6 hours	3 0 0	Alexander M'Donald, Farrochel.
114	Blair-Drummond, &c.,	Baad Farm,	Feb. 6, 1867	31	2¼ roods	6 hours	3 15 6	John Bowie, Coldoch.
115	Comrie & Upper Strathearn,	Fairness Farm,	Feb. 21, 1867	17	⅓ acre	6½ hours	3 8 6	James Kay, Lawers.
116	Drummond Castle,	Templemill,	Feb. 22, 1867	20	1 r. 34 p. 14 yds.	7 hours	3 17 6	Nathaniel Walker, Standing Fauld.
117	Dunblane,	Craigton,	Feb. 26, 1867	30	½ acre	5 hours	3 13 0	Alexander Lennox, Callings.
118	Gask,	Drumharvie,	Feb. 20, 1867	20	⅓ acre	6 hours	4 9 6	John Graeme, Cairnie.
119	Glenalmond,	The Cairnies,	Feb. 28, 1867	16	81 poles	6 hs. 5 ms.	3 8 0	Daniel Miller, Fendoch.
120	Glengarry and Glenerrochy,	Struan,	Apr. 3, 1867	15	¼ acre	4 hours	6 16 6	Duncan M'Gregor, Blair Manse.
121	Kilmadock,	Earn Farm,	Feb. 12, 1867	37	1/9 acre	6 hours	5 9 0	Walter Balfour, Mansfield.
122	Madderty,	Parkside,	Feb. 27, 1867	18	1 r. 39 p. 15 yds.	5 hs. 40 ms.	10 4 0	James Hunter, Cowdens.
123	Monzievaird and Strowan,	Lennoch,	Mar. 28, 1867	22	¾ acre	8 hours	5 6 3	James Kemp, Lawers.
124	Moulin,	Wester Auchlatt,	Feb. 26, 1867	19	½ acre	4½ hours	3 15 0	Peter Cameron, Blairchroisk.
125	Port of Montelth,	Castle of Rednoch,	Feb. 20, 1867	16	½ acre	6 hours	3 3 0	David Liddell, Lennieston.
126	Rannoch,	Wester Tempar,	Apr. 5, 1867	15	⅖ acre	7 hours	3 2 6	Duncan Menzies, Annat.
127	St Martins,	Rashiehall,	Feb. 19, 1867	28	⅕ acre	5 hours	4 9 0	James Robertson, Gairdrum.
128	Strathbraan,	Meikle Findin,	Mar. 28, 1867	15	⅕ acre	6 hours	3 16 6	Donald M'Leish, Pitleoch.
129	Strathearn (Central),	Invermay,	Feb. 21, 1867	20	⅕ acre	5 hours	3 1 0	John Todd, Belhie.
130	Weem,	Castle Menzies,	Feb. 28, 1867	33	2 roods 18 poles	7 hours	5 0 0	William Menzies, Tirinie.

PLOUGHING COMPETITIONS REPORTED TO THE SOCIETY IN 1866-67—*Continued.*

No.	Name of Society.	Place of Competition.	Date.	No. of Ploughs.	Extent.	Time.	Amount of Premiums.	First Premium and Silver Medal Awarded to
							£ s. d.	
	RENFREWSHIRE—							
131	Cathcart and Eastwood, .	Shairmoss, . .	Feb. 5, 1867	17	60 poles	7 hours	5 5 6	John Craig, Cowglen.
132	Erskine, ...	Hairshaw, . .	Feb. 13, 1867	20	½ acre	7 hours	3 3 0	James Brown, Newton.
133	Inchinnan, ...	Craig End, . .	Feb. 26, 1867	27	60 poles	5 hs. 24 ms.	5 0 0	William Dunlop, Inchinnan.
	ROSS-SHIRE—							
134	Easter Ross, . . .	Shandwick Mains, .	Mar. 1, 1867	45	½ acre	5 hours	6 0 0	Donald Graham, Arabella.
135	Wester Ross, . . .	Drummondreach, .	Nov. 27, 1866	46	½ to ¾ acre	6 hours	5 17 0	Kenneth M'Combie, Tulloch Mains.
	ROXBURGHSHIRE—							
136	Lilliesleaf, . . .	Minto Kames, .	Dec. 11, 1866	35	⅓ acre	5½ hours	9 18 0	Andrew Pender, Fandlaw.
137	Melrose, ...	Broomielees, . .	Dec. 15, 1866	23	⅓ acre	5 hours	5 12 0	Richard Ronaldson, Whitehill.
138	West Teviotdale, . .	Linton Parkhead, .	Dec. 29, 1866	35	⅓ acre	5 hours	10 10 0	Andrew Davidson, Adderstonshiels.
	STIRLINGSHIRE—							
139	Arnprior, ...	Newburn, . .	Feb. 27, 1867	17	1 acre	14 hours	3 10 0	William M'Gibbon, Faraway.
140	Bannockburn and Plean, .	Coxit Hill, . .	Feb. 6, 1867	25	⅓ acre	5 hours	5 5 0	William Hill, Inches.
141	E. D. of Stirlingshire, .	Newlands, . .	Feb. 6, 1867	29	⅓ acre	7 hours	7 8 6	Archibald Ronald, Dorrotor.
142	Gargunnock, . . .	Keppdarroch, . .	Feb. 13, 1867	26	Rate of 1 Sc. ac.	13 hours	5 0 0	William Forrester, Keppdarroch.
143	Killearn and Lower Stath Endriek, ...	Drumbeg, . . .	Feb. 5, 1867	19	⅓ acre	7 hours	4 8 6	John Brown, Kilfaset.
144	Kilsyth, ...	Dumbreck, . .	Feb. 12, 1867	16	Rate of 1 acre	17 hours	5 0 0	Robert M'Leod, Netherinch.
145	Muiravonside, . . .	Hillhead, . . .	Feb. 6, 1867	24	2 roods	7 hours	5 8 0	John Gentleman, Parkhall.
	WIGTOWNSHIRE—							
146	Kirkmaiden, . . .	Clanyard, . . .	Dec. 29, 1866	49	Rate of 1 acre	12 hours	5 1 0	Alexander M'Colm, Slockmill.
147	Machars, ...	Drumbrae, . .	Feb. 5, 1867	33	⅓ acre	4¾ hours	3 12 0	William Davidson, Barsalloch.
148	Old Luce, ...	Kilfillan, . . .	Feb. 16, 1867	24	⅓ acre	5 hs. 30 ms.	5 7 0	John M'Culloch, Whitefield.
149	Stoneykirk, ...	Balgreggan, . .	Dec. 13, 1866	90	½ acre	5 hours	5 7 6	David Blair, Auchantibert.

STATE OF THE FUNDS

OF

THE HIGHLAND AND AGRICULTURAL SOCIETY,

At 30th NOVEMBER 1867.

I. Investments on Bonds, &c.—			
Heritable Bonds, . . .	£10,800	0	0
Railway Debentures, . . .	7,450	0	0
Glasgow Water Corporation Debentures,	1,000	0	0
	£19,250	0	0
II. Value of Bank Stocks, at price on 30th November 1867, . . .	25,411	9	6
III. Balance due by Royal Bank of Scotland,	3,224	14	1
IV. Ten Shares (£500) of Stock of British Fishery Society, valued at . .	200	0	0
V. Property on George IV. Bridge, .	3,100	0	0
VI. Furniture, Pictures, and Books, .	1,000	0	0
VII. Value of Medals on Hand, . .	13	8	0
VIII. Sum outstanding in connection with Glasgow Show, . . .	450	0	0
IX. Arrears of Members' Subscriptions considered Recoverable, . .	180	14	0
	£52,830	5	7

KENNETH MACKENZIE, C.A., *Auditor.*

ABSTRACT of the ACCOUNTS of the HIGHLAND and

CHARGE.

1.	BALANCE due by Royal Bank of Scotland at 30th November 1866,						£1,065	14
2.	ARREARS of Annual Subscriptions then due,			£249	15	6		
	Whereof due by Life Members since compounded, and thus extinguished, £72, 3s.; since ordered to be written off as irrecoverable, £77, 16s. 6d.,			149	19	6		
							99	16 0
3.	MEDALS on hand at 30th November 1866,						23	15 0
4.	BALANCE then due on Inverness Show,						10	0 0
5.	INCOME FROM INVESTMENTS—							
	Interest on £10,800 Heritably Secured,			£449	2	9		
	,, on £8,450 on Debenture Bonds,			389	9	11		
	,, on Bank Accounts,			7	10	10		
				£846	3	6		
	Dividends on £12,120, 14s. 1d. of Bank Stock (present value £25,411, 9s. 6d.), £1,239 8 5							
	Dividend on £500 of the Stock of British Fishery Society, 20 0 0							
				1,259	8	5		
							2,105	11 11
6.	SUBSCRIPTIONS—							
	Annual Subscriptions,			£766	1	6		
	Life do.,			1,008	8	0		
							1,774	9 6
7.	SUBSCRIPTIONS to Chemical Department,						97	7 6
8.	RECEIPTS at Glasgow Show,			£4,889	11	8		
	Add received on account of former Shows,			1	7	6		
							4,890	19 2
9.	SUM in Debenture Bonds uplifted for Re-investment,						3,120	0 0
							£13,187	13 4

EDINBURGH, *7th January* 1868.

AGRICULTURAL SOCIETY of SCOTLAND, for the YEAR 1866-67.

DISCHARGE.

1. ESTABLISHMENT—			
Salary to Secretary for year to Martinmas 1867,		£700	0 0
Auditor for year 1866,		30	0 0
Clerk for 1867, £210; Junior Clerk, £27, 12s.,		237	12 0
Curator of Machinery, £10; Messenger, £60, 15s.,		70	15 0
	£1,038	7	0
Feu-Duty, £28; Taxes, £33, 2s. 1d.; Water-Duty, £1, 10s.,		62	12 1
Gas, £5, 10s. 10d.; Coals, £13, 3s.; Fire Premiums, £6, 10s.,		25	3 10
Repairs and Furnishings—Curtains, £43; Plans, £21; Roof Lights, £15; Sundries, £17, 19s. 6d.,		96	19 6
	£1,223	2	5
2. CHEMICAL DEPARTMENT—			
Salary to Professor, £300; Manures and Allowances to Experimenters, £109, 11s.,		409	11 0
3. VETERINARY DEPARTMENT—			
Allowance to Professor, £26, 5s.; Medals, £5, 12s.; Advertising, £2, 11s. 9d.,		34	8 9
4. PREMIUMS—			
Glasgow Show, £1,374, 15s. 6d.; District Competitions. £55, 9s.; Ploughing Competitions, £96, 17s.; Reports, £98, 4s.; Prizes (Agricultural Class), £10,		1,635	5 6
5. PRINTING, £54, 3s.; Advertising, £33, 14s.; Stationery, £32, 10s.; Post and Receipt Stamps, £39, 5s. 6d.,		159	12 6
6. AGENTS for Collecting Subscriptions,		2	7 5
7. SOCIETY'S TRANSACTIONS — Printing, £173, 3s.; Circulating, £57, 15s. 10d.,		230	18 10
8. OLD and Remarkable Trees — Printing Returns, &c., £61, 16s.; Editor, £42, 10s.,		104	6 0
9. TRIALS OF STEAM PLOUGHS — Fees, &c., to Practical Engineer, £14, 2s.; Committee's Expenses, £3, 8s.,		17	10 0
10. VOTE for Testimonial to Rev. Patrick Bell,		100	0 0
11. MISCELLANEOUS—			
Subscriptions to Meteorological Society, £5; Re-striking Medals, £6, 11s.; Frame for Mr Maxwell's Portrait, £6, 14s. 6d.; Reporting Meetings, £3, 13s.; Travelling Expenses, £15, 9s. 8d.; Bank Charges, £4, 15s.; Incidental Outlays, £11, 18s.,		54	1 2
12. EXPENSES of Glasgow Show 1867, as per Auditor's States,		2,047	13 8
13. INVESTMENTS—On Debenture Bonds, £2000; on Heritable Bond, £1300,		3,300	0 0
	£9,318	17	3
14. ARREARS OF SUBSCRIPTIONS TO GLASGOW SHOW—Due by Counties of Lanark, £300; Renfrew, £150,	£450 0 0		
15. BALANCE in Royal Bank at close of Account,	3,224 14 1		
16. ARREARS of Subscriptions considered recoverable,	180 14 0		
17. VALUE of Medals on hand,	13 8 0		
		3,868	16 1
	£13,187	13	4

ANTHONY MURRAY, *Convener of Finance Committee.*
GRAHAM BINNY, *Director, and Member of Finance Committee.*
KENNETH MACKENZIE, C.A., *Auditor.*

ABSTRACT OF ACCOUNTS—

CHARGE.

1. Local Subscriptions—			
1. Lanarkshire Voluntary Assessment on Proprietors,			£300 0 0
2. Ayrshire do. do.			448 13 2
3. Renfrewshire do. do.			150 0 0
4. Argyllshire do. do.			200 0 0
5. Buteshire do. do.			35 0 0
6. Glasgow—Contribution by Town Council,			200 0 0
			£1,333 13 2
2. Amount Collected during Show—			
1. Drawn at Gates,	£2,817 9 8		
2. By Sale of Catalogues and Awards,	188 9 3		
			3,005 18 11
3. Rents of Stalls and Shedding—			
1. Rent of Stalls,	£343 18 0		
2. Implement Shedding and Entry-Money,	118 9 0		
3. Servants' Accommodation,	12 10 0		
			474 17 0
4. Rent of Refreshment Rooms,			60 0 0
5. Litter Sold in Show Yard,			6 9 6
6. Interest from Bank,			8 13 1
			£4,889 11 8

Edinburgh, *7th January* 1868.

ABSTRACT of the ACCOUNTS of the

CHARGE.

1. Balance in Royal Bank of Scotand at 30th November 1866,	£205 6 2
2. Interest on £3000 Heritable Security,	132 15 0
3. Interest on £2200 Debenture Bonds,	94 18 0
4. Progressive Interest on Bank Account,	1 16 6
	£434 15 8

Edinburgh, *7th January* 1868.

GLASGOW SHOW, 1867.

DISCHARGE.

1. Show Yard—			
1. Fitting up Show Yard,	£1,102	0	0
2. Bedding for Stock,	35	15	0
3. Flags, Poultry Dishes, Money Bags, and Boiler,	11	10	6
4. Miscellaneous Expenditure,	0	16	10
	£1,150	2	4
2. Police Force,	48	2	0
3. Travelling Expenses of Judges, Secretary, Clerks, &c.,	102	3	3
4. Hotel and other Bills for Judges, Deputation of Directors, Secretary, &c.,	217	11	8
5. Tickets to Banquet for Judges and Staff,	20	14	0
6. Balance on Banquet Account,	46	14	0
7. Bands in Show Yard,	45	3	4
8. Printing Catalogues, Awards, &c.,	229	17	0
9. Advertising—at Railway Stations, £20; in Newspapers, £33, 5s. 9d.,	53	5	9
10. Allowance to Local Secretaries,	21	0	0
11. Allowance to Curator of Machinery, and Travelling Expenses,	24	6	0
12. Extra Clerks,	32	0	0
13. Assistants, Porters, and Attendants,	17	11	6
14. Postage Account,	32	18	8
15. Stationery,	3	10	0
16. Incidental Expenses, Carriage of Catalogues, &c.,	2	14	2
Amount of General Expenses,	£2,047	13	8
17. Premiums drawn at 30th November 1867,	1,374	15	6
18. Balance,	1,467	2	6
	£4,889	11	8

From the above Balance of	£1,467	2	6
There must be deducted the Premiums, &c. undrawn at 30th November, amounting to	160	0	0
Leaving a surplus of	£1,307	2	6

ANTHONY MURRAY, *Convener of Finance Committee.*
GRAHAM BINNY, *Director, and Member of Finance Committee.*
KENNETH MACKENZIE, C.A., *Auditor.*

ARGYLL NAVAL FUND for 1866-67.

DISCHARGE.

1. Allowance to Five Recipients,	£186	13	4
2. Balance in Royal Bank at 30th Nov. 1867,	248	2	4
	£434	15	8

ANTHONY MURRAY, *Chairman of Finance Committee.*
GRAHAM BINNY, *Director, and Member of Finance Committee.*
KENNETH MACKENZIE, C.A., *Auditor.*

STANDING COMMITTEES FOR 1868.

1. ARGYLL NAVAL FUND.

Admiral Sir William J. Hope Johnstone, K.C.B., *Convener*
Vice-Admiral William Ramsay, C.B.
William S. Walker of Bowland.
Graham Binny, W.S., Edinburgh.
Hew Crichton, S.S.C., Edinburgh.

2. CHEMISTRY.

Professor Anderson, Glasgow, *Convener.*
Sir Thomas Buchan Hepburn of Smeaton, Bart.
Professor Lyon Playfair, C.B., Edinburgh.
„ Allman, Edinburgh.
„ Balfour, Edinburgh.
„ Wilson, Edinburgh.
Henry Stephens, Redbrae, Edinburgh.
Robert Russell, Pilmuir, Leven.
George Harvey, Whittingham Mains, Prestonkirk.
James Melvin, Bonnington, Ratho.
John Gibson, Woolmet, Dalkeith.
Robert Scot Skirving, Camptoun, Drem.
Patrick Dudgeon of Cargen.
William Goodlet, Bolshan, Arbroath.
Thomas Park, Stoneyhill, Musselburgh.
George Hope, Fenton Barns, Drem.
William Gray, Southfield, Duddingston, Edinburgh.

3. COTTAGES.

Harry Maxwell Inglis of Logan Bank, *Convener.*
John Ord Mackenzie of Dolphinton.
Archibald Campbell Swinton of Kimmerghame, Dunse.
Thomas Coutts Trotter, Bilston Lodge, Loanhead.

4. DISTRICT SHOWS.

Archibald Campbell Swinton of Kimmerghame, *Convener.*
Sir Thomas Buchan Hepburn of Smeaton, Bart.
Robert Pillans Newton of Castlandhill, Kerse, Falklrk.
John Stirling of Kippendavie, Dunblane.
William S. Walker of Bowland.
John Ord of Muirhouselaw, Nisbet, Kelso.
Alexander M'Dougal, Granton Mains, Edinburgh.
Thomas Mylne, Niddrie Mains, Liberton.

STANDING COMMITTEES FOR 1868—*Continued.*

5. FINANCE.

Anthony Murray of Dollerie, *Convener.*
Right Hon. Sir William Gibson-Craig of Riccarton, Bart.
John Ord Mackenzie of Dolphinton.
William S. Walker of Bowland.
John Stirling of Kippendavie, Dunblane.
Graham Binny, W.S., Edinburgh.
Hew Crichton, S.S.C., Edinburgh.
Thomas Coutts Trotter, Bilston Lodge, Loanhead.
Kenneth Mackenzie, C.A., Edinburgh.

6. GENERAL SHOWS.

Alexander Kinloch, yr. of Gilmerton, *Convener.*
Sir James Gardiner Baird of Saughton Hall, Bart.
Professor Macquorn Rankine, Glasgow.
John Gibson, Woolmet, Dalkeith.
George Harvey, Whittingham Mains, Prestonkirk.
John Curror, Comiston, Lothian Burn.
James Hope, Duddingston, Edinburgh.
William Goodlet, Bolshan, Arbroath.
Archibald Campbell Swinton of Kimmerghame.
George Prentice of Strathore, Kirkcaldy.
William Gray, Southfield, Duddingston, Edinburgh.
George Hope, Fenton Barns, Drem.
William S. Walker of Bowland.
Thomas Mylne, Niddrie Mains, Liberton.
Alexander M'Dougal, Granton Mains, Edinburgh.
Thomas Coutts Trotter, Bilston Lodge, Loanhead.

7. HOUSE AND BUILDINGS.

John Ord Mackenzie of Dolphinton, *Convener.*
Sir James Gardiner Baird of Saughton Hall, Bart.
Anthony Murray of Dollerie.
William S. Walker of Bowland.
J. G. Heddle of Melsetter.
Graham Binny, W.S., Edinburgh.

8. MACHINERY.

John Gibson, Woolmet, Dalkeith, *Convener.*
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Professor Macquorn Rankine, Glasgow.
George Hope, Fenton Barns, Drem.
Henry Stephens, Redbrae, Edinburgh.
William Sadler, Ferrygate, Drem.
James Wilson, Wester Cowden, Dalkeith.
Thomas Park, Stoneyhill, Musselburgh.
Robert Russell, Pilmuir, Leven.
Thomas Mylne, Niddrie Mains, Liberton.

STANDING COMMITTEES FOR 1868—*Continued.*

9. PREMIUMS FOR REPORTS ON THE SCIENCE AND PRACTICE OF AGRICULTURE.

Professor Lyon Playfair, C.B., Edinburgh, *Convener.*
„ Anderson, Glasgow.
„ Balfour, Edinburgh.
„ Allman, Edinburgh.
„ Wilson, Edinburgh.
Alexander Forbes Irvine of Drum.
Robert Hutchison of Carlowrie, Kirkliston.
John Gibson, Woolmet, Dalkeith.
And all the Directors.

10. PREMIUMS FOR REPORTS ON WOODS AND PLANTATIONS.

Professor Balfour, Edinburgh, *Convener.*
William S. Walker of Bowland.
Alexander Forbes Irvine of Drum.
Patrick Dudgeon of Cargen.
Robert Pillans Newton of Castlandhill, Kerse, Falkirk.
Robert Hutchison of Carlowrie, Kirkliston.
Charles Lawson of Borthwick Hall.

11. PUBLICATIONS.

Alexander Forbes Irvine of Drum, *Convener.*
Professor Balfour, Edinburgh.
Henry Stephens, Redbrae, Edinburgh.
Robert Russell, Pilmuir, Leven.
J. G. Heddle of Melsetter.
William S. Walker of Bowland.
Robert Pillans Newton of Castlandhill.

12. VETERINARY COLLEGE EXAMINATIONS.

Andrew Gillon of Wallhouse, *Convener.*
Sir Alexander C. Ramsay Gibson Maitland of Barnton, Bart.
Professor Balfour, Edinburgh.
„ Allman, Edinburgh.
„ Anderson, Edinburgh.
Dr Burt, Edinburgh.
Archibald Campbell Swinton of Kimmerghame, Dunse.
William S. Walker of Bowland.
Alexander Kinloch, yr. of Gilmerton.
Henry Stephens, Redbrae, Edinburgh.
John Gibson, Woolmet, Dalkeith.
George Hope, Fenton Barns, Drem.
William Gray, Southfield, Duddingston, Edinburgh,
James Wilson, Wester Cowden, Dalkeith.
Thomas Mylne, Niddrie Mains, Liberton.
Alexander M'Dougal, Granton Mains, Edinburgh.

The President, Vice-Presidents, Treasurer, and Honorary Secretary, are members *ex officio* of all Committees.

GENERAL NOTICE.

THE HIGHLAND SOCIETY was instituted in the year 1784, and established by Royal Charter in 1787. Its operation was at first limited to matters connected with the improvement of the Highlands of Scotland; but the supervision of certain departments, proper to that part of the country, having been subsequently committed to special Boards of Management, several of the earlier objects contemplated by the Society were abandoned, while the progress of agriculture led to the adoption of others of a more general character. The exertions of the Society were thus early extended to the whole of Scotland, and have, for the greater part of a century, been directed to the promotion of the science and practice of agriculture in all its branches.

In accordance with this more enlarged sphere of action, the original title of the Society was altered, under a Royal Charter, in 1834, to THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND.

The leading purposes of the Institution are set forth in the following pages, where it will be found that Premiums are awarded for Reports on almost every subject connected with the cultivation of the soil; the rearing and feeding of stock; the management of the dairy; the improvement of agricultural machinery and implements; the growth of timber; the extension of cottage accommodation; the application of chemical science; and the dissemination of veterinary information.

Among the more important measures which have been effected by the Society are—

1. Agricultural Meetings and General Shows of Stock, Implements, &c., held in the principal Towns of Scotland, at which Exhibitors from all parts of the United Kingdom are allowed to compete.

2. A system of District Shows instituted for the purposes of improving the breeds of Stock most suitable for different parts of the country, and of aiding and directing the efforts of Local Agricultural Associations.

3. The promotion of Agricultural Education, under powers conferred by a supplementary Royal Charter granted in 1856, and authorising "The COUNCIL of the HIGHLAND AND AGRICULTURAL SOCIETY ON EDUCATION" to grant Diplomas to Students of Agriculture (see p. 61).

4. The advancement of the Veterinary Art, by conferring Diplomas on Students who have passed through a prescribed curriculum, and who are found, by public examination, qualified to practise.

5. The appointment of a Chemist, for the purpose of promoting the application of science to agriculture. Investigations on subjects of importance are conducted in the Laboratory, and published in the Transactions. Members can obtain analyses, reports, and advice, on terms below those charged to others (see p. 64).

6. The periodical publication of the Transactions, which comprehend the proceedings in the Laboratory, reports of experiments, and other communications invited and approved by the Society.

CONSTITUTION AND MANAGEMENT.

The general business of THE HIGHLAND AND AGRICULTURAL SOCIETY is conducted under the sanction and control of a Royal Charter, which authorises the enactment of Bye-Laws. Business connected with Agricultural Education is conducted under the authority of a Supplementary Royal Charter, also authorising the enactment of Bye-Laws.

The Office-Bearers consist of a President, Four Vice-Presidents, Ten Extraordinary, and Thirty Ordinary Directors, a Treasurer, an Honorary and an Acting Secretary, an Auditor, and other Officers. The proceedings of the Directors are reported to General Meetings of the Society, held in January, and in June or July. The Council on Education, under the Supplementary Charter, consists of Sixteen Members—Nine nominated by the Charter, and Seven elected by the Society. The Board of Examiners consists of Twelve Members.

Members are elected at the half-yearly General Meetings. The ordinary subscription is L.1, 3s. 6d. annually, which may be redeemed by one payment, varying, according to the number of previous annual payments, from L.12, 12s. to L.7, 1s. Tenant-Farmers, Secretaries, and Treasurers of local Agricultural Associations, resident Agricultural Factors, and Proprietors farming the whole of their own lands, whose valuation does not exceed L.500, are admitted on a subscription of 10s. annually, which may be redeemed by one payment, varying, according to the number of previous annual payments, from L.5, 5s. to L.3.

Members of the Society receive the Transactions on application, and are entitled to apply for District Premiums—to report Ploughing Matches for the Medal—to attend Shows free of charge, and to exhibit Stock and consult the Chemist at reduced rates.

Orders, payable at the Royal Bank of Scotland, are issued by the Directors, in name of the parties in whose favour Premiums have been awarded.

All communications must be addressed to "FLETCHER NORTON MENZIES, Esq., Secretary of the Highland and Agricultural Society of Scotland, No. 3 GEORGE IV. BRIDGE, EDINBURGH."

ESTABLISHMENT FOR 1868.

President.

THE DUKE OF BUCCLEUCH AND QUEENSBERRY, K.G.

Vice-Presidents.

THE EARL OF DALHOUSIE, K.T.
THE EARL OF FIFE, K.T.
THE EARL OF SOUTHESK.
THE EARL OF KINTORE.

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Robert Elliot, Laighwood.
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JOHN ORD of Muirhouselaw.
Major JOHN RAMSAY of Barra.
ROBERT RUSSELL, Pilmuir.
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CHARLES LAWSON of Borthwick Hall.
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THOMAS MYLNE, Niddrie Mains.
THOMAS COUTTS TROTTER, Bilston Lodge.
JOHN WILSON, Edington Mains.

Office-Bearers.

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Sir WILLIAM STIRLING MAXWELL of Keir, Bart., M.P., *Honorary Secretary.*
FLETCHER NORTON MENZIES, *Secretary.*
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W. J. MACQUORN RANKINE, LL.D., Professor of Civil Engineering in the University of Glasgow, *Consulting Engineer.*
ALEXANDER SLIGHT, *Practical Engineer.*
GOURLAY STEELL, R.S.A., *Animal Portrait Painter.*
WILLIAM WILLIAMS, *Professor of Veterinary Surgery.*
JOHN ADAM M'BRIDE, *Professor of Cattle Pathology.*
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JOHN MACDIARMID, *Junior Clerk.*
WILLIAM BLACKWOOD & SONS, *Publishers.*
NEILL & COMPANY, *Printers.*
MACKAY, CUNNINGHAM, & Co., *Silversmiths.*
ALEXANDER KIRKWOOD & SON, *Medallists.*
JOHN WATHERSTON & SONS, *Inspectors of Works.*
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Argyll Naval Fund, .	Admiral Sir WM. J. HOPE JOHNSTONE, K.C.B.
Chemistry, . . .	Professor ANDERSON.
Cottages, . . .	HARRY MAXWELL INGLIS of Logan Bank.
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Machinery, . . .	JOHN GIBSON, Woolmet.
Premiums for Reports on the Science and Practice of Agriculture, . .	Professor LYON PLAYFAIR, C.B.
Premiums for Reports on Woods and Plantations,	Professor BALFOUR.
Publications, . . .	ALEXANDER FORBES IRVINE of Drum.
Veterinary College Examinations, . . .	ANDREW GILLON of Wallhouse.

All communications should be addressed to FLETCHER NORTON MENZIES, Esq., Secretary of the Highland and Agricultural Society of Scotland, No. 3 George IV. Bridge, Edinburgh.

Council on Education.

By a Supplementary Charter under the Great Seal, granted in 1856, the Society is empowered to prescribe a Curriculum for Agricultural Education, and to grant Diplomas (see p. 61).

Members of Council named by Charter.

The PRESIDENT of the HIGHLAND and AGRICULTURAL SOCIETY—*President.*
The LORD JUSTICE-GENERAL—*Vice-President.*

The LORD ADVOCATE.
The DEAN OF FACULTY.
The PROFESSOR of AGRICULTURE.
The PROFESSOR OF ANATOMY.
The PROFESSOR of BOTANY.
The PROFESSOR of CHEMISTRY.
The PROFESSOR of NATURAL HISTORY.

Members of Council named by Society.

Lord COLONSAY.
Sir WM. GIBSON-CRAIG, Bart.
Sir A. C. R. GIBSON-MAITLAND, Bart.
GEORGE HOPE, Fenton Barns.
ROBERT RUSSELL, Pilmuir.
HENRY STEPHENS, Redbrae.
JOHN WILSON, Edington Mains.

Board of Examiners.

Science and Practice of Agriculture—Mechanics and Construction—Professor WILSON; GEORGE HOPE, Fenton Barns; ROBERT RUSSELL, Pilmuir; and JOHN WILSON, Edington Mains.
Botany—Professor BALFOUR.
Chemistry—Professor ANDERSON.
Natural History—Professor ALLMAN.
Veterinary Surgery—Professor WILLIAMS.
Field Engineering and Surveying—Professor MACQUORN RANKINE and DAVID STEVENSON, C.E.
Book-keeping and Accounts—KENNETH MACKENZIE, C.A., and ARCHIBALD PATERSON, Meadowfield.

Chambers.

No. 3 GEORGE IV. BRIDGE, EDINBURGH.

PREMIUMS.

GENERAL REGULATIONS FOR COMPETITORS.

All Reports must be legibly written, and on one side of the paper only; they must specify the number and subject of the Premium for which they are in competition; they must bear a distinguishing motto, and be accompanied by a sealed letter similarly marked, containing the name and address of the Reporter; initials must not be used.

No sealed letter, unless belonging to a report found entitled to one-half of the Premium offered, will be opened without the author's consent.

Reports, for which a Premium, or one-half of it, has been awarded, become the property of the Society, and cannot be published, in whole or in part, nor circulated in any manner, without the consent of the Directors. All other papers will be returned to the authors, if applied for within twelve months.

When a Report is unsatisfactory, the Society is not bound to award the whole or any part of a Premium.

All Reports must be of a practical character, containing the results of the writer's own observation or experiment, and the special conditions attached to each Premium must be strictly fulfilled. General essays, and papers compiled from books, will not be rewarded. Weights and measurements must be indicated by the imperial standards.

The decisions of the Board of Directors are final and conclusive as to all Premiums, whether for Reports or at General or District Shows; and it shall not be competent to raise any question or appeal touching such decisions before any other tribunal.

Reports on subjects not included in the Premium List will be received, and honorary rewards will be given when merited.

CLASS I.

REPORTS.

SECTION 1.—ON SUBJECTS CONNECTED WITH THE SCIENCE AND PRACTICE OF AGRICULTURE.

1. AGRICULTURE OF ABERDEENSHIRE AND BANFFSHIRE.

For an approved Report on the Agriculture of Aberdeenshire and Banffshire—Thirty Sovereigns.

The Report should embrace full details of the different systems of Farm Management observed in the district, and of the progress which Agriculture has made within the last 25 years.

Reports to be lodged by 1st November 1868.

2. AGRICULTURE OF EAST LOTHIAN.

For an approved Report on the Agriculture of East Lothian—Thirty Sovereigns.

The Report should embrace full details of the different systems of Farm Management observed in the district, and of the progress which Agriculture has made within the last 25 years.

Reports to be lodged by 1st November 1868.

3. MANURES PRODUCED BY DIFFERENT KINDS OF FEEDING.

For an approved Report of the result of experiments for ascertaining the comparative value of farm-yard Manure, obtained from cattle fed upon different varieties of food, by the application of such manures to farm crops—Twenty Sovereigns.

The Report must state the effects produced on two successive crops by the application of manure obtained from cattle fed on different sorts of food, such as turnips and straw alone; and turnips and straw, with an addition of oil-cake, linseed, bean-meal, grain, or other substances. The animals should be as nearly as possible of the same age, weight, condition, and maturity, and each lot should receive daily the same quantity of litter; and, except as to the difference of food, they must be treated alike.

The preparation of the manure, by fermentation or otherwise, should be in every respect the same; and it is desirable that not less than two several experiments be made with each kind, and that the ground to which it is to be applied be as equal as possible in quality and condition.

Reports to be lodged by 1st May in any year.

4. MANURE MADE WITH AND WITHOUT COVER.

For an approved Report on the comparative value of Manure made in the ordinary manner, and of Manure kept under cover till applied to the Land—Twenty Sovereigns.

The experiment may be conducted either with manure made in the open straw-yard, contrasted with that made in covered hammels or boxes, or with manure made in feeding houses, part of which shall have been placed under cover, and part removed to the open dung-pit, and kept carefully unmixed with any other manure. Preference will be given to experiments embracing both of these modes. The cattle must be fed and littered alike. There must be at least an acre of land experimented on with each sort of manure—the different lots must be manured to the same extent, and be equal in soil, and the crops must be accurately weighed and measured on two separate portions of each lot, not less than 20 poles. The result, as given by two successive crops, to be reported.

Reports to be lodged by 1st May in any year.

5. AUTUMN MANURING.

For an approved Report on the comparative advantages of applying Manure to the stubble in autumn, or in the drills in spring, for turnips, potatoes, or beans—Twenty Sovereigns.

The experiment must extend over two years, and comprise a green crop and a grain crop. It must be conducted on not less than four acres—one-half of which shall be dunged in autumn, and the other in spring, with manure made as nearly as possible in the same way, and of equal quantity and quality. The treatment and condition of the land prior to the experiment must be mentioned.

As the object of this premium is to determine the comparative advantages of autumn manuring, there will be no restriction as to labouring the land; but the reporter must state how that was done on each lot during the experiment, which, if possible, should be repeated in duplicate.

Reports to be lodged by 1st May 1869.

6. IMPROVED VARIETIES OF AGRICULTURAL PLANTS.

For an approved Report on the means successfully employed for obtaining new and superior varieties, or improved sub-varieties, of any of the cereal grains, grasses, roots, or other agricultural plants—The Gold Medal, or Ten Sovereigns.

It is necessary that the varieties and sub-varieties reported upon shall have been proved capable of reproduction from seed, and also that the relation they bear to others, or well-known sorts, should be stated. The reporter is further requested to mention the effects that he may have observed produced by different soils, manures, &c., on the plants forming the subjects of report, and how far he may have ascertained such effects to be lasting.

Should any improved variety reported upon be the result of direct experiment by cross impregnation, involving expense and long-continued attention, a higher premium will be awarded.

Reports to be lodged by 1st November 1868.

7. COMPARATIVE PRODUCTIVENESS, &C., OF POTATOES.

For an approved Report on the comparative productiveness and general qualities for use and keeping of different kinds of Potatoes used in field culture—The Gold Medal, or Ten Sovereigns.

Reports to be lodged by 1st November 1868.

8. COMPARATIVE PRODUCTIVENESS, &C., OF TURNIPS.

For an approved Report of the comparative productiveness and general qualities for use and keeping of the different kinds of Swedish, Yellow, and White Turnips, generally used in field culture—The Gold Medal, or Ten Sovereigns.

Reports to be lodged by 1st May 1869.

9. CULTIVATION OF CABBAGE.

For an approved Report on the cultivation of the Cabbage as a field crop—The Gold Medal, or Ten Sovereigns.

The experiment must be conducted on not less than one acre, and contrasted with a like extent under turnips in the same field. Both lots must have been under one rotation, and must be prepared and manured in the same manner.

Reports to be lodged by 1st May 1869.

10. VEGETABLE PRODUCTIONS OF INDIA, CHINA, AMERICA, &C.

For an approved Report on the hardy and useful Herbaceous Plants, including Grains and Grasses of China, Japan, the Islands of the Eastern Archipelago, the Himalaya country, the Falkland and South Sea Islands, California, the high north-western districts of America, or any other country where such climate exists as to induce the belief that the plants may be beneficially introduced into the cultivation of Scotland—The Gold Medal, or Ten Sovereigns.

Reporters are required to give the generic and specific names of the plants treated of, with the authority for the same—together with the native names, in so far as known; and to state the elevation of the locality and nature of the soil in which they are cultivated, or which they naturally inhabit, with their qualities or uses; and it is further requested that the descriptions be accompanied, in so far as possible, with specimens of the plants, and their fruit, seed, or other products.

Reports to be lodged by 1st November in any year.

FEEDING STOCK.

The experiments specified in Nos. 11 and 12 must be conducted over a period of not less than three months. No lot shall consist of fewer than four Cattle or ten Sheep. The animals selected should

be of the same age, sex, and breed, and, as nearly as possible, of the same weight, condition, and maturity. The live weight before and after the experiment must be stated, and, if killed, their dead weight and quantity of tallow.

11. BEST MODES OF HOUSING FATTENING CATTLE.

For an approved Report on the comparative advantages of fattening Cattle in stalls, in loose houses or boxes, and in sheds or hammels—Twenty Sovereigns.

The Report must detail the comparative result of actual experiments. The same quantities and kinds of food shall be used. Information is required as to the comparative expense of attendance, the cost of erecting the buildings, and any other circumstances deserving of attention. The state of the weather during the experiment, in point of temperature and wetness, must be particularly noted and reported.

Reports to be lodged by 1st May in any year.

12. DIFFERENT DESCRIPTIONS OF FOOD.

For an approved Report of experiments for ascertaining the actual addition of weight to growing or fattening stock, by the use of different kinds of food—Twenty Sovereigns.

The attention of the experimenter is directed to turnips, carrots, beet, mangold-wurzel, potatoes, cabbage, as well as to beans, oats, barley, Indian corn, linseed, oil-cake, or rape-cake, and to the effect of warmth and proper ventilation, and the difference between food cooked and raw. The above roots and other kinds of food are merely suggested; competitors are neither restricted to them, nor obliged to experiment on all of them.

When experiments are made with linseed and cake, attention should be paid to the comparative advantages, economically and otherwise, of the substances in these two states.

Before commencing the comparative experiments, the animals must be fed alike for some time previously.

The progress of different breeds may be compared. This will form an interesting experiment of itself, for reports of which encouragement will be given.

Reports to be lodged by 1st May in any year.

13. EXAMINING HORSES AS TO SOUNDNESS.

For an approved Report on the duties of the Veterinary Surgeon in the Examination of Horses as to Soundness—The Medium Gold Medal, or Five Sovereigns.

Competition is limited to Members of Veterinary Medical Associations.

Reports to be lodged by 1st November 1868.

14. PLEURO-PNEUMONIA.

For an approved Report on Pleuro-Pneumonia—its reported disappearance during the restrictions on the movements of cattle

—its reappearance when these restrictions were removed—and the best method to be adopted for its eradication—The Gold Medal, or Ten Sovereigns.

Reports to be lodged by 1st November 1868.

15. DISINFECTING AGENTS FOR STOCK.

For an approved Report on disinfecting Agents, especially Sulphurous Acid and Carbolic Acid, for preventing attacks of Cattle Plague and Pleuro-Pneumonia, or in extirpating these diseases when they have appeared—The Gold Medal, or Ten Sovereigns.

Reports to be lodged by 1st November 1868.

16. SANITARY ARRANGEMENTS FOR STOCK.

For an approved Report on the best construction and arrangement of Byres, Sheds, and Courts for Cattle, with a view to sanitary requirements—The Gold Medal, or Ten Sovereigns.

The Report must have reference to all descriptions of stock, whether breeding, feeding, dairy, or young cattle.

Reports to be lodged by 1st November 1868.

17. TRANSIT OF STOCK.

For an approved Report on the conditions which should regulate the Carriage of Stock by railway, or by sea, as well as its transit by road—Twenty Sovereigns.

The reporter will refer to the various modes by which stock is usually forwarded; to the disadvantages attaching thereto, and the evils resulting therefrom; and to the manner in which these should be obviated.

Reports to be lodged by 1st November 1868.

18. DIPPING AND SMEARING SHEEP.

For an approved Report on the processes of Dipping, Pouring, and Smearing Sheep, and the materials employed for the purpose—Twenty Sovereigns.

The reporter must discuss the relative advantages of Dipping, Pouring, and Smearing, the use of summer dips, the nature and qualities of the different materials which have been used, and their effect on the wool and on the health of the Sheep. The facts detailed must be derived from the practical experience of the reporter.

Reports to be lodged by 1st November 1869.

19. MANAGEMENT OF POULTRY.

For an approved Report on the profitable extension of the Poultry Department in a mixed Farm in Scotland—The Medium Gold Medal, or Five Sovereigns.

The Report must specify the breeds most recommended, mode of

housing, feeding, and general treatment, with an abstract of receipts and expenditure for a year.

Reports to be lodged by 1st November 1868.

20. RURAL ECONOMY ABROAD.

For an approved Report, founded on personal observation, of any useful practice, in rural economy, adopted in other countries, and susceptible of being introduced with advantage into Scotland—The Gold Medal.

The purpose chiefly contemplated by the offer of this premium is to induce travellers to notice and record such particular practices as may seem calculated to benefit Scotland.

Reports to be lodged by 1st November in any year.

SECTION 2.—LAND IMPROVEMENTS.

1. GENERAL IMPROVEMENT OF ESTATES.

To the Proprietor who shall report the most judicious, successful, and extensive improvements—The Gold Medal, or Ten Sovereigns.

The merits of the Report will not be determined so much by the mere extent of the improvements, as by their character and relation to the size of the property. The improvements may comprise reclaiming, draining, enclosing, planting, road-making, building, and all other operations proper to landed estates. The period within which the operations may have been conducted is not limited, except that it must not exceed the term of the reporter's proprietorship.

Reports to be lodged by 1st May in any year.

2. RECLAMATION OF WASTE LAND BY TILLAGE.

1. For an approved Report by a Proprietor or Tenant of having reclaimed within the six preceding years not less than fifty acres of waste land—The Gold Medal, or Ten Sovereigns.

2. For an approved Report by a Tenant of having reclaimed within the four preceding years not less than twenty acres of waste land—The Medium Gold Medal, or Five Sovereigns.

3. For a similar Report by a Tenant of having reclaimed not less than ten acres—The Silver Medal.

The Reports may comprehend such general observations on the improvement of waste lands as the writer's experience may lead him to make, but must refer especially to the lands reclaimed—to the nature of the soil—the previous state and probable value of the subject—the obstacles opposed to its improvement—the details of the various operations—the mode of cultivation adopted—and the produce and value of the crops produced. As the required extent cannot be made up of different patches of land, the improvement

must have relation to one subject; it must be of a profitable character, and a rotation of crops must have been concluded before the date of the report. *A detailed statement of the expenditure and return*, and a certified measurement of the ground, are requisite.

Reports to be lodged by 1st May in any year.

3. IMPROVEMENT OF NATURAL PASTURE WITHOUT TILLAGE.

1. For an approved Report of an improvement of the pasturage of not less than thirty acres, by means of top-dressing, draining, or otherwise without tillage, in situations where tillage may be inexpedient—The Gold Medal, or Ten Sovereigns.

2. For an approved Report of a similar improvement of not less than ten acres—The Silver Medal.

Reports must state the particular mode of management adopted, the substances applied, the elevation and nature of the soil, its previous natural products, and the changes produced.

Reports to be lodged by 1st May in any year.

SECTION 3.—AGRICULTURAL MACHINERY.

INVENTION OR IMPROVEMENT OF IMPLEMENTS OF HUSBANDRY.

For approved Reports of such inventions or improvements, by the reporters, of any agricultural implement or machine as shall be deemed by the Society of public utility—Medals, or sums of money not exceeding Fifty Sovereigns.

Reports may be lodged with the Secretary at any time, and should be accompanied by drawings and descriptions of the implement or machine, and, if necessary, by a model.

SECTION 4.—WOODS AND PLANTATIONS.

1. EXTENSIVE PLANTING.

For an approved Report by a Proprietor who shall, within the five preceding years, have planted not less than 150 acres. The whole planting operations that may have been conducted by the reporter within the five years, whether completed or not, must be embraced, and he must state the expense—description of soil —age, kind, and number of trees planted per acre—mode of planting, draining, and fencing—general state of the plantation —and any other observations of interest—The Gold Medal.

Reports to be lodged by 1st November in any year.

2. FORMATION AND MANAGEMENT OF YOUNG PLANTATIONS.

For an approved Report of Plantations formed within a period of not more than ten, nor less than five years preceding the date of the Report—The Gold Medal, or Ten Sovereigns.

The Report should comprehend every interesting particular; among others, the exposure, altitude, and general climate of the locality—the character and condition of the soil and subsoil—a detailed statement of the expense, including that of enclosing, draining, and fencing, and a specification of the manner in which these operations were performed—the mode of planting adopted—the prevailing weather while planting, and for a month after the operation—the kind of trees planted, and the number of each kind per acre—their relative progress—the proportion of blanks and deaths at the end of three years—the system of management—the state of the plantations at the date of making the report—and any other observations of interest.

Reports to be lodged by 1st November in any year.

3. GENERAL MANAGEMENT OF PLANTATIONS.

For an approved Report of the management of Plantations from the commencement of the first thinning till the period of yielding full-grown timber—The Gold Medal, or Ten Sovereigns.

The Report must embrace the following points:—The progress of the different sort of trees—the effects of altitude and exposure—the general advantages of shelter—the mode of thinning and pruning adopted—the uses and value of the thinnings—the plan of registry and of valuing, or a specimen of the method in which the forester's book is kept—the valuation at the time of the report—together with such general remarks as may be thought useful.

The Report is not expected to embrace the formation and early management, farther than the description of soil, kinds of plants, whether mixed or in masses, together with a note of the expense from the time of planting to the commencement of the first thinning, in so far as such information is in the possession of the reporter.

Reports to be lodged by 1st November in any year.

4. PLANTING ON EXPOSED OR ON BARREN TRACTS.

For an approved Report on successful planting within the influence of the sea, or on exposed sterile tracts, founded on observation of the habits and appearance of the different sort of trees considered best suited for such situations—The Gold Medal, or Ten Sovereigns.

The plantations reported on must not be less than ten years old.

Information is particularly desired regarding the species and varieties of trees calculated for growing in situations unfavourable to most of those generally cultivated, as bleak heaths, sandy links, unsheltered maritime situations, and high northern exposures.

The reporter must specify the extent of planting and mode of drainage and fencing—the nature of the soil and subsoil—the elevation and exposure of the locality—its distance from the sea; and, if in his power, he should notice the geological features of the district.

Reports to be lodged by 1st November in any year.

5. CORSICAN FIR.

For an approved Report on the value, for economical purposes, of the Corsican Fir, and on its adaptation to different soils and situations—The Medium Gold Medal, or Five Sovereigns.

The reporter's observations must go beyond the limited knowledge of this tree as hitherto grown in Britain, and must embrace its nature, uses, and adaptations in those countries of which it is a native.

Reports to be lodged by 1st November in any year.

6. AMERICAN AND CANADIAN TREES.

For an approved Report on the American and Canadian forest trees adapted for cultivation in Great Britain—The Medium Gold Medal, or Five Sovereigns.

The reporter will enumerate and describe the varieties which have been, or which may be, usefully introduced from North America—the soils, situations, and conditions most suitable for them—their economic uses and qualities, and the success which may have attended the cultivation of any of them in Great Britain.

Reports to be lodged by 1st November 1867.

7. FOREST TREES OF RECENT INTRODUCTION.

For an approved Report on the more extended introduction of hardy, useful, or ornamental trees, which have not hitherto been generally cultivated in Scotland—The Medium Gold Medal, or Five Sovereigns.

The report should specify as distinctly as possible the kind of trees introduced. The adaptation of the trees for use or ornament, and their comparative progress, should be mentioned. Attention is directed to the introduction of any tree as a nurse in young plantations, which by growing rapidly for several years, and attaining maturity when at the height of 20 or 25 feet, might realise the advantages and avoid the evils of thick planting.

Reports to be lodged by 1st November in any year.

8. ROOTS OF CONIFERÆ.

For an approved Report of experiments on the uses to which the fibrous parts of the roots of Coniferous trees may be applied —The Medium Gold Medal, or Five Sovereigns.

In North-West America, the fibrous parts of the roots of some Coniferous trees are extensively employed for purposes similar to those to which willows are applied in this country, more particularly when the wood has been grown on soft, peaty soils. The object of the premium is to elicit information regarding the possibility of profitably extracting and economically applying the vast quantities of roots left in the ground.

Reports to be lodged by 1st November in any year.

CLASS II.

DISTRICT COMPETITIONS.

The Money Premiums awarded at District Competitions will be paid after 1st *January next, by precepts issued by the Directors. No payments must, therefore, be made by the Secretary or Treasurer of any local Association.*

(*Grants in aid of* DISTRICT COMPETITIONS *for* 1869 *must be applied for before* 1st NOVEMBER *next*).

SECTION 1.—CATTLE.

1. *The District of Strontian.*
2. *The District of Kintyre.*
3. *The County of Dumbarton.*
4. *The District of Nithsdale.*
5. *The Islands of Shetland.*
6. *The District of Annandale.*
7. *The Island of Skye.*
8. *The County of Elgin.*
9. *The County of Nairn.*
10. *The District of Perth, Fife, Kinross, and Clackmannan.*
11. *The County of Banff and District of Turriff.*
12. *The County of Kincardine.*
13. *The District of Formartine.*

Conveners of Committees.

FIRST DISTRICT—Sir Thomas Miles Riddell, Bart.
SECOND DISTRICT—John Lorn Stewart of Coll.
THIRD DISTRICT—Alexander Smollett of Bonhill.
FOURTH DISTRICT—John Gilchrist Clark of Speddoch.
FIFTH DISTRICT—John Bruce of Sumburgh.
SIXTH DISTRICT—Sir William Jardine, Bart.
SEVENTH DISTRICT—Alexander K. Mackinnon of Corry.
EIGHTH DISTRICT—C. L. Cumming Bruce, M.P.
NINTH DISTRICT—W. A. Stables, Cawdor Castle.
TENTH DISTRICT—Sir Wm. Stirling Maxwell, Bart., M.P.
ELEVENTH DISTRICT—Alexander Morison of Bognie.
TWELFTH DISTRICT—Sir Thomas Gladstone, Bart.
THIRTEENTH DISTRICT—John Ramsay of Barra.

Premiums.

1. For the best Bull, of any pure breed, not exceeding eight years old, belonging to a Proprietor—The Silver Medal.
2. For the best Bull, of any pure breed, calved before 1st January 1866, and not exceeding eight years old, £7
3. For the second best, ... £4
4. For the best Bull, of any pure breed, calved after 1st January 1866, ... £6
5. For the best two-year-old Heifer (if Highland breed, three years), of any pure breed, . . . £5
6. For the second best, ... £3

Proprietors farming the whole of their own lands may compete for the Money Premiums.

Note.—The Society's Cattle Premiums are granted to each District for three alternate years, on condition that the District shall, in the two intermediate years, continue the Competitions by offering for the same description of stock a sum not less than one-half of that given by the Society.

At the intermediate Competitions, a Silver Medal will be placed at the disposal of the Committee, to be awarded to the best lot exhibited.

In 1868,

No. 1 is in competition for the last year.
No. 2 for the second year.
Nos. 3 and 4 for the first year.
Nos. 5, 6, 7, 8, 9, and 10 compete for local Premiums.
Nos. 11, 12, and 13 are in abeyance on account of the Aberdeen Show.

Rules of Competition.

1. The Members of the Society connected with the respective Districts are appointed Committees for arranging the Competitions ; five members to be a quorum.

2. The Convener of each District shall summon a meeting of Committee for the purpose of determining the time and place of Competition, the nomination of Judges, and other preliminary arrangements. The time and place (which must be within the bounds of the District) shall be publicly intimated by Conveners.

3. The Competitionsm ust take place between the 1st of April and the 20th of October, and are open to all parties within the District, whether members of the local Association or not. The animals exhibited must belong to one of the following pure breeds :—Shorthorn, Ayrshire, Polled (Galloway, Angus, or Aberdeen), Highland. The Bulls may be of one breed, and the Heifers of another. The Committee shall select the breed, and specify it in the returns.

4. Stock of an inferior description, or which does not fall within the prescribed regulations, shall not be placed for competition. The Premiums shall not be divided. *No Money Premium shall be adjudged unless there are three lots exhibited, and not more than one-half unless there are six.* A competitor may exhibit two lots in each class. For the Medal, two lots are required.

5. An animal which has gained the Society's first Premium at a previou District or General Show is inadmissible in the same class, except for the Medal; and one which has gained a second Money Premium can only thereafter compete in that class for the first.

6. A Tenant or Factor may compete with Proprietors for the Medal with a Bull which has gained the first Money Premium at a previous Show. When there is any doubt as to whether a competitor should be ranked as a Proprietor, or a Tenant, the point is left to the decision of the local Committee.

7. A Bull, the property of two or more Tenants, may compete, although the Exhibitors may not be joint-tenants.

8. Stock must be the property of the Exhibitor at the date of entry, *and no entry shall be received later than one week previous to the Show.* Entry-money shall not exceed $2\frac{1}{2}$ per cent. on the amount of the Premium to be competed for.

9. Bulls for which the Money Premiums are awarded may be required to serve in the District at least one season; the rate of service to be fixed by the Committee.

10. Should it be proved to the satisfaction of the Committee that an animal has been entered under a false name, pedigree, or description, for the purpose of misleading the Committee or Judges as to its qualifications or properties, the case shall be reported to the Directors, and submitted by them to the first General Meeting, in order that the Exhibitor shall be disqualified from again competing at the Society's Shows, and his name, if he be a member, struck from the roll.

11. When an animal has previously been disqualified by the decision of any Agricultural Association in Great Britain or Ireland, such disqualification shall attach, if the Exhibitor, being aware of the disqualification, fail to state it, and the grounds thereof, in his entry, to enable the Committee to judge of its validity.

12. Blank reports will be furnished to the Conveners of the different Districts. These must, in all details, be completed and lodged with the Secretary *on or before the 1st of November next*, for the approval of the Directors, against whose decisions there shall be no appeal.

13. A report of the Competition and Premiums awarded at the *intermediate* local Shows, in the several Districts, signed by a Member of the Society, must be transmitted to the Secretary *on or before the 1st November in each year*, otherwise the Society's grants shall terminate.

14. It is to be distinctly understood that in no instance does any claim lie against the Society for expenses attending a show of stock beyond the amount of the Premiums offered.

Section 2.—DRAUGHT HORSES.

The County of Ayr.

Convener of Committee.

Sir James Fergusson of Kilkerran, Bart., M.P.

PREMIUMS.

1. For the best Stallion, for agricultural purposes, not under three years and nine months, and not above twelve years old, ... £25
2. For the best Brood Mare, for agricultural purposes, £10
3. For the best Filly, foaled after 1st January 1866, . £5

These Premiums are granted for two years, £30 being contributed by the Society, and £10 by the District.

In 1868,

Ayr is in competition for the first year.

RULES OF COMPETITION.

1. The Members of the Society in the several Districts are appointed Committees of Superintendence. They shall be convened in the manner and for the purposes prescribed by Nos. 1 and 2 of the Regulations for Cattle Competitions.

2. The Competition for Stallions, and that for Mares and Fillies, may be held at different periods, but both must take place within the districts named, unless, in reference to Stallions, special permission has been obtained to the contrary.

3. If fewer than three animals be exhibited in any class, half the Premium only can be awarded. The Regulations for Cattle Shows, regarding intimation—entry of stock—its exclusion, if of inferior quality—false entries—extra expenses—and the manner in which the Reports are to be certified and transmitted to the Society—are severally applicable to the Premiums for Horses. Evidence must be produced that the Prize Stallions have had produce. Mares must have foals at their feet, or be entered as being in foal; in the latter case payment of the Premiums will be deferred till certificate of birth.

ENTIRE COLTS.

1. *The County of Lanark.*
2. *The District of Wester Ross.*
3. *The District of Perth, Fife, Kinross, and Clackmannan.*

Conveners of Committees.

First District—J. G. C. Hamilton of Dalzell.
Second District—K. W. Stewart Mackenzie of Seaforth.
Third District—Sir G. Graham Montgomery, Bart., M.P.

PREMIUMS.

1. For the best Entire Colt, for agricultural purposes, foaled after 1st January 1866. . . . £6

2. For the best Entire Colt, for agricultural purposes, foaled after 1st January 1867, . . . £4

Four lots in each Class will warrant the award of full, and two lots of half, premiums. The other regulations for Horses are generally applicable. These premiums are granted for two years.

In 1868,

No. 1 is in competition for the last year.
Nos. 2 and 3 for the first year.

Section 3.—SHEEP.

The Premiums for Sheep are granted for three alternate years, under the same conditions as those for Cattle. See Note, p. 22.
A Silver Medal, as in the case of Cattle, is allowed for the intermediate years.

1. LEICESTER BREED.

1. *The County of Edinburgh.*
2. *The Stewartry of Kirkcudbright.*
3. *The County of Forfar.*
4. *The District of the Border Union Society.*

Conveners of Committees.

First District—Sir James Gardiner Baird, Bart.
Second District—Wellwood H. Maxwell of Munches, M.P.
Third District—Sir John Ogilvy, Bart., M.P.
Fourth District—Sir George H. Scott Douglas, Bart.

1. For the best Tup, belonging to a Proprietor—The Silver Medal.
2. For the best Tup of any age, ... £5
3. For the best Shearling Tup, ... £5
4. For the best Pen of five Ewes, not more than four Shear, £5
5. For the best Pen of five Gimmers or Shearling Ewes, £4

Proprietors farming the whole of their own lands may compete for the Money Premiums.

In 1868,

Nos. 1 and 2 are in competition for the second year.
Nos. 3 and 4 compete for local Premiums.

2. CHEVIOT BREED.

1. *The District of Mull, Coll, and Tyree.*
2. *The Districts of Eskdale and Liddesdale.*
3. *The Pastoral District of Ross-shire.*
4. *The County of Sutherland.*

Conveners of Committees.

First District—Farquhar Campbell of Aros.
Second District—William E. Malcolm of Burnfoot.
Third District—Sir Kenneth S. Mackenzie of Gairloch, Bart.
Fourth District—The Duke of Sutherland, or in his absence, George Loch.

1. For the best Tup belonging to a Proprietor—The Silver Medal.
2. For the best Tup of any age, . . . £5
3. For the best Shearling Tup, . . . £5
4. For the best Pen of five Ewes, not more than four Shear, £5
5. For the best Pen of five Gimmers or Shearling Ewes, £4

Proprietors farming the whole of their own lands may compete for the Money Premiums.

In 1868,

No. 1 is in competition for the second year.
No. 2 for the first year.
Nos. 3 and 4 compete for local Premiums.

3. BLACKFACED BREED.

DISTRICTS.

1. *The Upper Ward of Lanarkshire.*
2. *The District of Argyle.*
3. *The District of Lorn.*
4. *The District of Athole and Weem.*
5. *The District of Badenoch.*

Conveners of Committees.

First District—John Ord Mackenzie of Dolphinton.
Second District—William Campbell of Ormsary.
Third District—T. W. Murray Allan of Glenfeochan.
Fourth District—Sir Robert Menzies of Menzies, Bart.
Fifth District—Cluny Macpherson

1. For the best Tup belonging to a Proprietor—The Silver Medal.
2. For the best Tup of any age, . . . £5
3. For the best Shearling Tup, . . . £5
4. For the best Pen of five Ewes, not more than four Shear, £5
5. For the best Pen of five Gimmers or Shearling Ewes, £4

Proprietors farming the whole of their own lands may compete for the Money Premiums.

In 1868,

Nos. 1 and 2 are in competition for the last year.
No. 3 for the second year.
Nos. 4 and 5 compete for local Premiums.

RULES OF COMPETITION.

1. The Members of the Society in the several Districts are appointed Committees as under Nos. 1 and 2 of the Regulations for Cattle Competitions, and they shall be convened in the manner and for the purposes specified in these regulations.

2. The Competition is open to all within the district; it shall take place between the 1st of April and the 20th of October, and the time and place must be publicly intimated by each Convener within his district.

3. Aged Tups shall have served the usual number of Ewes for at least three weeks during the previous season. All prize Tups must serve within the district. Ewes and Gimmers must be taken from the Exhibitor's stock, bred in the district; and Ewes must have reared Lambs during the season.

4. The Premiums shall not be divided. *No money Premiums shall be adjudged unless there are three lots exhibited, and only one half if there are not six lots.* Each Competitor may show two lots. For the medal two lots are required. The other regulations for Cattle Competitions,—in regard to the date of entry—the amount of entry-money—the placing of stock—the exclusion of animals which have gained premiums at previous Shows—the right of a tenant or factor, under certain circumstances, to compete for the medal—reporting false entries—the regulation as to expenses—the manner in which the reports must be certified and transmitted—and the incompetency of appeal against decisions by the Directors,—are applicable to the Premiums for Sheep.

5. Blank reports will be furnished to the Conveners of districts. These must be accurately filled up in all details, signed by the Conveners, and transmitted to the Secretary *by the 1st of November.* Reports of intermediate competitions must be lodged at the same time.

4. SHEARING SHEEP.

The Silver Medal will be given to the best Sheep-shearer in each of the districts in which the premiums for Sheep are in operation.

CONDITIONS.

1. Money Premiums must be awarded by the district at each competition to the amount of not less than £2.

2. The district Convener will fix the time and place of competition, and make all necessary arrangements.

3. The medal shall not be awarded unless there are three competitors, and it shall always accompany the highest money premium. If two or more lots appear to be equally well executed, preference should be given to that executed within the shortest time.

4. The Conveners shall report the particulars of the competition and the award of the Judges to the Society, along with the report of the sheep premiums in the district.

Section 4.—SWINE.

DISTRICTS.

The County of Orkney.

Convener of Committee.

J. G. Heddle of Melsetter.

1. For the best Boar belonging to a Proprietor—The Silver Medal.
2. For the best Boar, ... £4
3. For the second best, ... £2
4. For the best brood Sow, ... £3
5. For the second best, ... £1

Proprietors farming the whole of their own lands may compete for the Money Premiums.

The above Premiums are given for three consecutive years.

In 1868,

Orkney is in competition for the first year.

RULES OF COMPETITION.

1. The Regulations for Cattle Competitions are generally to be held as applicable to the Premiums for Swine ; and the Conveners and Committees of the Society's members in the districts are accordingly referred to them.

2. Four lots in each Class will warrant the award of full, and two lots of half premiums. There must be at least two competitors for the medal.

3. Blank reports will be furnished to the Conveners of districts. These must be accurately filled up in all details, signed by the Conveners, and transmitted to the Secretary *by the first of November next.*

CLASS III.

DAIRY PRODUCE.

DISTRICTS.

1. *The Lower Ward of Renfrewshire.*
2. *The District of Lorn.*

Conveners of Committees.

First District—Sir Michael R. Shaw Stewart, Bart.
Second District—T. W. Murray Allan of Glenfeochan.

1. BUTTER.

1. For the best sample of Cured Butter (not less than 14 lbs.) belonging to a Proprietor—The Silver Medal.
2. For the best sample of Cured Butter (not less than 14 lbs.) £3
3. For the second best, ... £2

2. CHEESE.

4. For the best couple of Sweet Milk Cheeses belonging to a Proprietor—The Silver Medal.
5. For the best couple of Sweet Milk Cheeses, . . £3
6. For the second best, ... £2

Proprietors farming the whole of their own lands may compete for the Money Premiums.

The above Premiums are given for three consecutive years.

In 1868,

No. 1 is in competition for the last year.
No. 2 for the first year.

RULES OF COMPETITION.

1. The Members of the Society resident within the districts are appointed Committees of Superintendence, for the purposes expressed in the regulations for Cattle Competitions. Each Committee shall fix such general regulations as they may consider proper, and, in particular, the time and place of Competition.

2. Eight Exhibitors in any one Class will warrant an award of full, and four of half Premiums. There must be at least two Competitors for the Medal.

3. Competitors must certify that the Butter and Cheese exhibited by them are average specimens of the produce of their Dairies in 1868; and that the

quantity produced during the season has not been less than 1 cwt. of Butter, or 2 cwt. of Cheese.

4. In the event of two or more competing lots being deemed equal in quality, the Premium shall be awarded to the Competitor who has made the larger quantity.

5. The successful Competitors, before receiving the Premiums, are required to transmit to the Secretary a detailed report of the whole process followed by them in the manufacture of their Butter or Cheese.

6. Reports of the award of the Premiums to be lodged with the Secretary *on or before the 1st November next.*

MEDALS FOR CHEESE.

Two Medium Gold Medals will be placed at the disposal of the Ayrshire Association, to be competed for at Kilmarnock. The one, for the best lot of Cheddar Cheese—the other, for the best lot of Sweet Milk Cheese of any other variety; the Cheeses in either case, to be made in Scotland.

Convener of Committee.

Colonel Ferrier Hamilton of Cairnhill.

CLASS IV.

CROPS AND CULTURE.

1. SEEDS.

The Society, with a view of aiding Local Associations, gives the Silver Medal in the following Districts, for Seeds:—

1. County of CAITHNESS: Convener, Alexander Henderson of Stemster.
   1. Any variety of Barley.
   2. Any variety of Oats.

2. Islands of SHETLAND: Convener, John Bruce of Sumburgh.
   1. Any variety of Bere.
   2. Any variety of Oats.
   3. Perennial Ryegrass.

3. District of SPEY, AVON, and FIDDOCHSIDE: Convener, Sir George Macpherson Grant, Bart.
   1. Any variety of Barley.
   2. Any variety of Oats.

4. District of STRATHEARN: Convener, Viscount Strathallan.
   1. Any variety of Oats.

5. District of STRATHSPEY: Convener, The Earl of Seafield.
   1. Any variety of Barley.
   2. Early Angus Oats.

6. County of ELGIN: Convener, C. L. Cumming Bruce of Roseisle, M.P.
   1. Any variety of Wheat.
   2. Any variety of Barley.
   3. Any variety of Oats.
   4. Any variety of Turnips.
   5. Any variety of Potatoes.
   6. Perennial Ryegrass.

7. County of STIRLING: Convener, John Stirling of Kippendavie.

1. Any variety of Wheat.
2. Any variety of Barley.
3. Any variety of Oats.
4. Any variety of Beans.
5. Tares.

8. District of DALKEITH: Convener, Robert Scott Moncrieff of Fossoway.

1. Any variety of Wheat.
2. Any variety of Barley.
3. Any variety of Oats.
4. Any variety of Beans.

9. District of GLEN URQUHART: Convener, The Earl of Seafield.

1. Any variety of Oats.

10. County of BANFF and District of TURRIFF: Convener, Alexander Morison of Bognie.

1. Any variety of Barley.
2. Any variety of Oats.

In 1868,

Nos. 1, 2, 3 and 4 are in competition for the fourth year.
Nos. 5 and 6 for the second year.
Nos. 7, 8, 9, and 10 for the first year.

RULES OF COMPETITION.

1. In each district the Convener shall fix the time and place of Competition, appoint the Judges, and make all other necessary arrangements, in concurrence with the other Members of the Society, and the local Association of the District. Conveners will be furnished with blank Schedules for reporting the awards.

2. The quantity shown in Competition by each Grower must not be less than three quarters of each variety of Grain, or two quarters of Beans or Grass Seeds. There must at least be two Competitors. The first Premium awarded by the District shall not be less than £1 for each kind of Grain for which a Medal is claimed.

3. The Judges shall be guided in their awards—1*st*, By the purity of the Seed; 2*d*, By its freeness from extraneous Seeds; and, 3*d*, Where there is an equality in these respects, by the Weight.

4. Successful Competitors must transmit, free of expense, two imperial quarts of each kind of Seed, addressed to the Secretary, at the Society's Hall, 3 George IV. Bridge, Edinburgh.

5. The Returns must show, as accurately as possible, the produce per imperial acre, also the altitude, exposure, and nature of the soil on which the crops were raised, together with the dates of sowing and reaping, and the weight per bushel. The varieties for which premiums have been given must be named. Reports of the several competitions must be lodged *by the* 1*st of November*.

6. The Medals will be continued in each district for five consecutive years. Applications from other Districts must be lodged with the Secretary of the Society *by 1st November next.*

2. PLOUGHING COMPETITIONS.

The Silver Medal will be given to the winner of the first or highest Premium at Ploughing Competitions, provided a Report in the following terms is made to the Secretary, within one month of the Competition, by a Member of the Society:—

FORM OF REPORT.

I, of Member of the Highland and Agricultural Society, hereby certify that I attended the Ploughing Match of the Association at in the county of on the when ploughs competed; of land was assigned to each, and hours were allowed for the execution of the work. The sum of £ was awarded in the following proportions, viz.:—

[Here enumerate the names and designations of successful Competitors.]

RULES OF COMPETITION.

1. All Matches must be at the instance of a local Society or Ploughing Association, and no Match at the instance of an individual, or confined to the tenants on one estate, will be recognised.
2. The title of such Society or Association, together with the name and address of the Secretary, must be registered with the Secretary of the Highland and Agricultural Society, 3 George IV. Bridge, Edinburgh.
3. Not more than one Match in the same season can take place within the bounds of the same Society or Association.
4. All Reports must be lodged within one month of the date of the Match, and certified by a Member of the Society who was present at it.
5. A Member can only report one Match, and a Ploughman can only carry one Medal in the same season.
6. To warrant the Medal there must have been fifteen ploughs in Competition, and Three Pounds awarded in Premiums.
7. Ploughmen shall not be allowed any assistance, and their work must not be set up nor touched by others; on land of average tenacity the ploughing should be at the rate of an imperial acre in ten hours, and attention should be given to the sufficiency of the work below, as well as its neatness above the surface.

3. REAPING MACHINES.

The Silver Medal will be given to the servant found most expert at a trial of Reaping Machines, when not fewer than four were in operation, and Premiums to the amount of Two Sovereigns were awarded. Reports must be lodged with the Secretary *not later than the 1st of November,* by a Member who has inspected the work.

4. MEDALS IN AID OF PREMIUMS GIVEN BY LOCAL SOCIETIES.

The Society being anxious to co-operate with local Associations, will give a limited number of Silver Medals annually, in addition to the Money Premiums awarded in the district, for—

1. STOCK.—To Local Societies not on the list of District Competitions, awarding Premiums for Stock to the amount of £10—Two Silver Medals for the best Male and for the best Female Animals of any Pure Breed.

2. FAT STOCK.—To Local Clubs not on the list of District Competitions, awarding Premiums for Fat Stock to the amount of £20—Four Silver Medals for the best Ox—Best Cow or Heifer—Best pen of Sheep—Best Pig.

3. WOOL.—Best sample of any variety of Wool—Silver Medal for each variety.
4. Best managed Farm.
5. Best managed Green Crop.
6. Best managed Hay Crop.
7. Best managed Dairy.
8. Best Sweet Milk Cheese.
9. Best Cured Butter.
10. Best Collection of Seeds.
11. Best Collection of Roots.
12. Best kept Fences.
13. Most expert Hedge Cutter.
14. Labourer most expert at Draining.
15. Best kept Flower Plot.

Aberdeenshire.

1. BUCHAN SOCIETY—Convener, George Baird of Strichen.
   1. Best Male and best Female Animals (in abeyance for 1868).

2. CLUNY ASSOCIATION—Convener, John Gordon of Cluny.
   1. Best Male and best Female Animals (in abeyance for 1868).
   2. Best managed Farm.
   3. Best managed Green Crop.

3. DONSIDE CLUB—Convener, George Milne of Kinaldie.
   1. Best managed Green Crop.

4. LEOCHEL-CUSHNIE SOCIETY—Con., Arthur Forbes Gordon of Rayne.
   1. Best Male and best Female Animals (in abeyance for 1868).
   2. Best managed Green Crop.

Argyllshire.

5. INVERARAY SOCIETY—Convener, John MacArthur, Inveraray.
   1. Best Male and best Female Animals.

6. KILFINAN SOCIETY—Convener, Campbell Macpherson Campbell of Ballimore.
   1. Best Male and best Female Animals.

Ayrshire.

7. Ardrossan Society—Convener, David Cunningham, Chapelton.
   1. Best Sweet Milk Cheese.
   2. Best Cured Butter.

8. Carrick Society—Convener, Sir James Fergusson, Bart., M.P.
   1. Best managed Green Crop.

9. Cumnock Society—Convener, C. V. H. Campbell of Nether Place.
   1. Best Male and best Female Animals.
   2. Best Sweet Milk Cheese.
   3. Best Cured Butter.
   4. Best Collection of Seeds.
   5. Best Collection of Roots.

10. Kilmarnock Club—Convener, Frederick J. Turner, The Dean.
    1. Best managed Farm.
    2. Best managed Green Crop.
    3. Best managed Dairy.

11. Mauchline Society—Con., C. V. Hamilton Campbell of Nether Place.
    1. Best Male and best Female Animals.
    2. Best managed Farm.
    3. Best managed Dairy.
    4. Best Cured Butter.

12. Sorn Society—Convener, Graham Somervell of Sorn.
    1. Best Male and best Female Animals.
    2. Best kept Fences.
    3. Best Sweet Milk Cheese.
    4. Best Cured Butter.

13. Stewarton Society—Convener, James Lindsay, Thornhill.
    1. Best Male and best Female Animals.
    2. Best Sweet Milk Cheese.

14. Tarbolton Society—Convener, John Bell of Enterkine.
    1. Best Sweet Milk Cheese.

15. West Kilbride Society—Convener, John Crawford, Millstonford.
    1. Best Male and best Female Animals.
    2. Best Sweet Milk Cheese.

Bute and Arran.

16. Bute Society—Convener, Henry Stuart, Rothesay.
    1. Best managed Green Crop.

17. Arran—Convener, James Paterson, Lamlash.
    1. Best Male and best Female Animals.

Caithness.

18. Caithness Society—Convener, Alexander Henderson of Stemster.
    1. Best Male and best Female Animals.

Clackmannan.

19. Clackmannanshire Society—Convener, James Johnstone of Alva.
    1. Best managed Green Crop.
    2. Best managed Hay Crop.

Dumfriesshire.

20. Nithsdale Society—Convener, Dr Russell, Thornhill.
    1. Best Sweet Milk Cheese.
    2. Best Cured Butter.

21. Sanquhar Society—Convener, James Veitch of Elliock.
    1. Best Male and best Female Animals.
    2. Best Sweet Milk Cheese.
    3. Best Cured Butter.
    4. Best Collection of Seeds.
    5. Best Collection of Roots.

Edinburghshire.

22. Penicuik Society—Convener,
    1. Best Male and best Female Animals.

23. Western District of Mid-Lothian Association—Convener, Peter M'Lagan of Pumpherston, M.P.
    1. Best Male and best Female Animals.

Elginshire.

24. Forres and Northern Club—Convener, Robert Grant of Kincorth.
    1. Best Ox.
    2. Best Cow or Heifer.
    3. Best Pen of Sheep.
    4. Best Pig.
    5. Best Collection of Seeds.
    6. Best Collection of Roots.

25. Spey, Avon, and Fiddochside Society—Convener, Sir George Macpherson Grant, Bart.
    1. Best Male and best Female Animals.
    2. Best managed Farm.
    3. Best managed Green Crop.

Inverness-shire.

26. Inverness Society—Conveners, Arthur Forbes of Culloden and Henry W. White of Monar.
    1. Best samples of any variety of Wool (five varieties).
    2. Best managed Farm.
    3. Best managed Green Crop.

Kincardineshire.

27. Kincardineshire Club—Convener, Sir Thomas Gladstone, Bart.
    1. Best managed Green Crop.

28. Fettercairn Club—Convener, Lieut.-Col. M'Inroy of the Burn.
    1. Best Male and best Female Animals (in abeyance for 1868).
    2. Best managed Green Crop.

Lanarkshire.

29. Avondale Society—Convener, John Stewart, Burnside.
    1. Best Male and best Female Animals.

30. Hutchesontown Gardens, Glasgow.
    1. Best kept Flower-Plot.

31. Victoria Gardens, Govanhill, Glasgow.
    1. Best kept Flower-Plot.

Linlithgowshire.

32. Whitburn Society—Convener, Robert Gardner, Whitburn.
    1. Best Male and best Female Animals.

Nairnshire.

33. Nairnshire Society—Convener, W. A. Stables, Cawdor Castle.
    1. Best managed Farm.

Orkney and Shetland.

34. Shetland Society—Convener, John Bruce of Sumburgh.
    1. Best Sweet Milk Cheese.
    2. Best Cured Butter.

Peeblesshire.

35. Broughton Society—Convener, James Tweedie of Quarter.
    1. Best Cured Butter.

36. West Linton Society—Convener, W. A. Woddrop of Dalmarnock.
    1. Best Sweet Milk Cheese.
    2. Best Cured Butter.

Perthshire.

37. Dunblane Club—Convener, John Stirling of Kippendavie.
    1. Best managed Green Crop.

Ross-shire.

38. Black Isle Society—Convener, James Fletcher of Rosehaugh.
    1. Best Male and best Female Animals.

39. Wester Ross Club—Convener, K. W. Stewart Mackenzie of Seaforth.
    1. Best Male and best Female Animals.

Wigtownshire.

40. Kirkmaiden Society—Convener, Gilbert R. Murray, Chapelrossan.
    1. Best Male and best Female Animals.

REGULATIONS.

The Medals to be issued will be limited to ten in each Class, except Nos. 1 and 2.

The Money Premiums given in the District must be £2 in each case, and in No. 1, £10, and No. 2, £20.

A Competitor can only carry one Medal in the same year with the same animal.

Reports of the several Competitions, and applications for Medals in 1869 must be lodged *by 1st November next.*

CLASS V.

COTTAGES AND GARDENS.

The following Premiums are offered for Competition in the Parishes after-mentioned. The Medals and one-half of the Premiums are given by the Society, and the other half is contributed by the respective Parishes.

COTTAGES.

1. For the best kept Cottage in each Parish—One Pound Five Shillings; and where there are four Competitors—The Silver Medal.
2. For the second best—One Pound.
3. For the third best—Fifteen Shillings.

GARDENS.

1. For the best kept Cottage Garden in each Parish—One Pound Five Shillings; and where there are four Competitors—The Silver Medal.
2. For the second best—One Pound.
3. For the third best—Fifteen Shillings.

Aberdeenshire.

Leochel-Cushnie—Convener, Arthur Forbes Gordon of Rayne.
Strichen—Convener, George Baird of Strichen.
Birse—Convener, James Dyce Nicol of Ballogie, M.P.
Lonmay and Crimond—Con., Sir Chas. Bannerman of Crimonmogate, Bart.
Cromar—Convener, Dr Robertson, Indego.

Edinburghshire.

Balerno and Currie—Convener, A. J. Russell, W.S., Edinburgh.

Fifeshire.

Markinch—Convener, William Ballingal, Sweetbank.

Lanarkshire.

Lesmahagow—Convener, W. E. Hope Vere of Blackwood.
Douglas—Convener, Andrew Smith, Castle Mains, Douglas.
Bothwell, (Addie's Square Flower Show), Con., Robert Addie of Viewpark.

Peeblesshire.

Broughton—Convener, James Tweedie of Quarter.

Perthshire.

Forgandenny—Convener, Robert Lyal, Farmhall.
Abernethy—Convener, John Bosomworth, Abernethy.
Gask—Convener, Colonel Macdonald Macdonald of St Martins.

Wigtownshire.

Kirkcolm—Convener, David Guthrie, Stranraer.
Leswalt—Convener, Sir Andrew Agnew of Lochnaw, Bart., M.P.
Stoneykirk—Convener, David Frederick, Dumbreddon.

RULES OF COMPETITION.

1. Competitions may take place in the different parishes for Cottages and Gardens, or for either separately.

2. The occupiers of Gentlemen's Lodges and Gardeners' Houses, as well as Gentlemen's Servants occupying Cottages in the Policies, or on land in the natural possession of their masters, are excluded. The inspection must be completed by the 1st of October. In making the inspection, the Conveners may take the assistance of any competent judges.

3. The annual value of each Cottage, with the ground occupied in the parish by a Competitor, shall not exceed £5 sterling. A person who has gained the highest Premium cannot compete again, but will be entitled to a Medal if certified by the Committee to be equal in merit to the first on the list of Competitors.

4. If the Cottage is occupied by the proprietor, the roof must be in good repair; if the roof is of thatch, it must be in good repair, though in the occupation of a tenant. The interior and external conveniences must be clean and orderly—the windows must be free of broken glass, clean, and affording the means of ventilation. Dunghills, and all other nuisances, must be removed from the front and gables. In awarding the Cottage Premiums, preference will be given to Competitors who, in addition to the above requisites, have displayed the greatest taste in ornamenting the exterior of their houses, and the ground in front and at the gables.

5. In estimating the claims for the Garden Premiums, the judges should have in view:—The sufficiency and neatness of the fences and walks; the cleanness of the ground; the quality and choice of the crops; and the general productiveness of the garden.

6. Reports, stating the number of Competitors, the names of successful parties, and the nature of the exertions which have been made by them, must be transmitted by the Conveners to the Secretary *on or before the* 1*st November next.*

Parishes desirous of these Premiums must lodge applications with the Secretary *on or before the* 1*st November next.*

MEDALS FOR COTTAGES OR GARDENS.

The Society will issue annually twelve Medals to local Associations or individuals, who at their own expense establish Premiums for Cottages or Gardens.

The Medals will be issued upon a Report by a Member of the Society in the terms required by the preceding conditions, describing the merits of the

Cottages or Gardens. The Reports to be lodged with the Secretary *on or before the* 15*th October* 1868.

Applied for by

The Mauchline Horticultural Society.
Sir George Macpherson Grant, Bart.
Breadalbane and Weem Horticultural Society.
West Linton Horticultural Society.
Culross Horticultural Society.
Dunning Horticultural Society.
Cumbrae Horticultural Society.
Logiealmond and Glenalmond Horticultural Society.

IMPROVING EXISTING COTTAGES.

To the Proprietor in Scotland who shall report the Improvement of the greatest number of Cottages in the years 1865, 1866, and 1867—The Gold Medal.

BUILDING NEW COTTAGES.

To the Proprietor in Scotland who shall report the Erection of the greatest number of approved Cottages during the years 1864, 1865, 1866, and 1867—The Gold Medal.

RULES OF COMPETITION.

1. Claims for the above Premiums must be lodged with the Secretary on or before the 1st of October next, to allow an inspection to be made of the different Cottages. The inspection will be conducted by a Committee of the Society's Members, and Reports must be transmitted to the Secretary *on or before the* 1*st November*.

2. The annual value of the Cottage or Cottages separately, with the garden ground, must not exceeed £5.

3. In estimating the claims of the Competitors, the following points will be kept in view:—The external appearance of the Cottages; their internal accommodation; the arrangements of the out-houses; the means of drainage and ventilation; and the expense of the building or of the alteration, compared with its durability and accommodation. When the Cottages of one Competitor are superior in style and comfort to those of another, though not so numerous, the Inspectors will give them the preference, provided they amount at least to three, and have been erected at a moderate expense.

4. Parties competing will forward to the Society Plans, Specifications, and Estimates, of which, and of all information sent therewith, copies may be taken for publication, if the Society shall see fit, and the originals returned to the parties within six months, if desired.

ACCOMMODATION FOR FARM SERVANTS.

To the Proprietor in Scotland who shall have erected on his estate the most approved Farm-buildings in reference to the proper accommodation of Farm-servants—The Gold Medal.

Reports, Plans, and Specifications to be lodged *by the* 1*st November* 1868.

GENERAL SHOW OF STOCK AND IMPLEMENTS

AT

ABERDEEN,

On 28th, 29th, and 30th July 1868.

President of the Society.

HIS GRACE THE DUKE OF BUCCLEUCH AND QUEENSBERRY, K.G.

Chairman of the Local Committee.

ALEXANDER FORBES IRVINE, Esq. of Drum, Convener of Aberdeenshire.

The District connected with the Show comprises the Counties of Aberdeen, Banff, and Kincardine, and Eastern Division of Forfar.

The Competition is open to Exhibitors from all parts of the United Kingdom.

Members of the Society are admitted to the Show Yard at half-price during the judging of the Stock. At other periods they have free access.

New Members may be proposed for election at the General Meeting in June.

PREMIUMS.

The Medium Gold Medal will be given to any animal which, having gained the Society's highest Premium at a former Show in the Classes of Aged Bulls—Cows—Stallions—or Mares, is disqualified from again competing.

CLASS I.—CATTLE.

Section		
	SHORTHORN.	
1.	Best Bull calved before 1st January 1866, ...	Twenty Sovereigns
	Second best, . . .	Ten Sovereigns
	Third best, . . .	Medium Silver Medal
	Breeder of best Bull, . .	Silver Medal

SECTION

2. Best Bull calved after 1st January 1866, ... Twenty Sovereigns
   Second best, . . . Ten Sovereigns
   Third best, . . . Medium Silver Medal
3. Best Bull calved after 1st January 1867, ... Ten Sovereigns
   Second best, . . . Five Sovereigns
   Third best, . . . Medium Silver Medal
4. Best Bull Calf calved after 1st January 1868, . . . Six Sovereigns
   Second best, . . . Three Sovereigns
   Third best, . . . Medium Silver Medal
5. Best Cow of any age, . . Fifteen Sovereigns
   Second best, . . . Eight Sovereigns
   Third best, . . . Medium Silver Medal
6. Best Heifer calved after 1st January 1866, . . . Ten Sovereigns
   Second best, . . . Five Sovereigns
   Third best, . . . Medium Silver Medal
7. Best Heifer calved after 1st January 1867, . . . Eight Sovereigns
   Second best, . . . Four Sovereigns
   Third best, . . . Medium Silver Medal
8. Best Heifer Calf calved after 1st January 1868, . . . Six Sovereigns
   Second best, . . . Three Sovereigns
   Third best, . . . Medium Silver Medal

POLLED ANGUS OR ABERDEEN.

9. Best Bull calved before 1st January 1866, . . . Twenty Sovereigns
   Second best, . . . Ten Sovereigns
   Third best, . . . Medium Silver Medal
   Breeder of best Bull, . . Silver Medal
10. Best Bull calved after 1st January 1866, ... Twenty Sovereigns
   Second best, . . . Ten Sovereigns
   Third best, . . . Medium Silver Medal
11. Best Bull calved after 1st January 1867, ... Ten Sovereigns
   Second best, . . . Five Sovereigns
   Third best, . . . Medium Silver Medal
12. Best Bull Calf calved after 1st January 1868, . . . Six Sovereigns
   Second best, . . . Three Sovereigns
   Third best, . . . Medium Silver Medal

Section		
13.	Best Cow of any age,	Fifteen Sovereigns
	Second best,	Eight Sovereigns
	Third best,	Medium Silver Medal
14.	Best Heifer calved after 1st January 1866,	Ten Sovereigns
	Second best,	Five Sovereigns
	Third best,	Medium Silver Medal
15.	Best Heifer calved after 1st January 1867,	Eight Sovereigns
	Second best,	Four Sovereigns
	Third best,	Medium Silver Medal
16.	Best Heifer Calf calved after 1st January 1868,	Six Sovereigns
	Second best	Three Sovereigns
	Third best,	Medium Silver Medal
	POLLED GALLOWAY.	
17.	Best Bull calved before 1st January 1866,	Twenty Sovereigns
	Second best,	Ten Sovereigns
	Third best,	Medium Silver Medal
	Breeder of Best Bull,	Silver Medal
18.	Best Bull calved after 1st January 1866,	Twenty Sovereigns
	Second best,	Ten Sovereigns
	Third best,	Medium Silver Medal
19.	Best Bull calved after 1st January 1867,	Ten Sovereigns
	Second best,	Five Sovereigns
	Third best,	Medium Silver Medal
20.	Best Cow of any age,	Fifteen Sovereigns
	Second best,	Eight Sovereigns
	Third best,	Medium Silver Medal
21.	Best Heifer calved after 1st January 1866,	Ten Sovereigns
	Second best,	Five Sovereigns
	Third best,	Medium Silver Medal
22.	Best Heifer calved after 1st January 1867,	Eight Sovereigns
	Second best,	Four Sovereigns
	Third best,	Medium Silver Medal
	HIGHLAND.	
23.	Best Bull calved before 1st January 1865,	Twenty Sovereigns
	Second best,	Ten Sovereigns
	Third best,	Medium Silver Medal
	Breeder of best Bull,	Silver Medal

Section		
24.	Best Bull calved after 1st January 1865,	Twenty Sovereigns
	Second best,	Ten Sovereigns
	Third best,	Medium Silver Medal
25.	Best Bull calved after 1st January 1866,	Ten Sovereigns
	Second best,	Five Sovereigns
	Third best,	Medium Silver Medal
26.	Best Cow of any age,	Fifteen Sovereigns
	Second best,	Eight Sovereigns
	Third best,	Medium Silver Medal
27.	Best Heifer calved after 1st January 1865,	Ten Sovereigns
	Second best,	Five Sovereigns
	Third best,	Medium Silver Medal
28.	Best Heifer calved after 1st January 1866,	Eight Sovereigns
	Second best,	Four Sovereigns
	Third best,	Medium Silver Medal

AYRSHIRE.

29.	Best Bull calved before 1st January 1866,	Twenty Sovereigns
	Second best,	Ten Sovereigns
	Third best,	Medium Silver Medal
	Breeder of best Bull,	Silver Medal
30.	Best Bull calved after 1st January 1866,	Twenty Sovereigns
	Second best,	Ten Sovereigns
	Third best,	Medium Silver Medal
31.	Best Cow, in Milk, of any age,	Fifteen Sovereigns
	Second best,	Eight Sovereigns
	Third best,	Medium Silver Medal
32.	Best Cow, in Calf, of any age,	Fifteen Sovereigns
	Second best,	Eight Sovereigns
	Third best,	Medium Silver Medal
33.	Best Heifer calved after 1st January 1866,	Ten Sovereigns
	Second best,	Five Sovereigns
	Third best,	Medium Silver Medal

FAT STOCK.

34.	Best Polled Ox calved after 1st January 1865,	Medium Gold Medal
	Second best,	Silver Medal
	Third best,	Medium Silver Medal

Section		
35.	Best Polled Ox calved after 1st January 1866,	Medium Gold Medal
	Second best,	Silver Medal
	Third best,	Medium Silver Medal
36.	Best Ox, of any Pure or Cross Breed, calved after 1st January 1865,	Medium Gold Medal
	Second best,	Silver Medal
	Third best,	Medium Silver Medal
37.	Best Ditto, after 1st January 1866,	Medium Gold Medal
	Second best,	Silver Medal
	Third best,	Medium Silver Medal
38.	Best Highland Ox calved after 1st January 1864,	Medium Gold Medal
	Second best,	Silver Medal
	Third best,	Medium Silver Medal
39.	Best Ditto, after 1st January 1865,	Medium Gold Medal
	Second best,	Silver Medal
	Third best,	Medium Silver Medal
40.	Best Cross Heifer calved after 1st January 1865,	Medium Gold Medal
	Second best,	Silver Medal
	Third best,	Medium Silver Medal
41.	Best Ditto, after 1st January 1866,	Medium Gold Medal
	Second best,	Silver Medal
	Third best,	Medium Silver Medal

CLASS II.—HORSES

FOR AGRICULTURAL PURPOSES.

1.	Best Stallion foaled before 1st January 1865,	Thirty Sovereigns
	Second best,	Fifteen Sovereigns
	Third best,	Medium Silver Medal
	Breeder of best Stallion,	Silver Medal.
2.	Best Entire Colt foaled after 1st January 1865,	Twenty Sovereigns
	Second best,	Ten Sovereigns
	Third best,	Medium Silver Medal
3.	Best Entire Colt foaled after 1st January 1866,	Fifteen Sovereigns
	Second best,	Eight Sovereigns
	Third best,	Medium Silver Medal
4.	Best Entire Colt foaled after 1st January 1867,	Ten Sovereigns
	Second best,	Five Sovereigns
	Third best,	Medium Silver Medal

SECTION

5. Best Mare (with Foal at foot) foaled before 1st January 1865, . Twenty Sovereigns
   Second best, . . . Ten Sovereigns
   Third best, . . . Medium Silver Medal
6. Best Mare (in Foal) foaled before 1st January 1865, . . Fifteen Sovereigns
   Second best, . . . Eight Sovereigns
   Third best, . . . Medium Silver Medal
7. Best Filly foaled after 1st January 1865, ... Ten Sovereigns
   Second best, . . . Five Sovereigns
   Third best, . . . Medium Silver Medal
8. Best Filly foaled after 1st January 1866, ... Eight Sovereigns
   Second best, . . . Four Sovereigns
   Third best, . . . Medium Silver Medal
9. Best Filly foaled after 1st January 1867, ... Six Sovereigns
   Second best, . . . Three Sovereigns
   Third best, . . . Medium Silver Medal

EXTRA.

10. Best Thorough-bred Entire Horse to serve in the district, . . One Hundred Sovs.

CLASS III.—SHEEP.

LEICESTER.

1. Best Tup not above four shear, . Ten Sovereigns
   Second best, . . . Five Sovereigns
   Third best, . . . Medium Silver Medal
2. Best Dinmont or Shearling Tup, . Ten Sovereigns
   Second best, . . . Five Sovereigns
   Third best, . . . Medium Silver Medal
3. Best Five Ewes not above four shear, Eight Sovereigns
   Second best, . . . Four Sovereigns
   Third best, . . . Medium Silver Medal
4. Best Five Shearling Ewes or Gimmers, ... Eight Sovereigns
   Second best, . . . Four Sovereigns
   Third best, . . . Medium Silver Medal

CHEVIOT.

5. Best Tup not above four shear, . Ten Sovereigns
   Second best, . . . Five Sovereigns
   Third best, . . . Medium Silver Medal

Section		
6.	Best Dinmont or Shearling Tup, .	Ten Sovereigns
	Second best, . . .	Five Sovereigns
	Third best, . . .	Medium Silver Medal
7.	Best Five Ewes not above four shear, ...	Eight Sovereigns
	Second best, . . .	Four Sovereigns
	Third best, . . .	Medium Silver Medal
	Best Pen of Lambs shown with Ewes, ...	Silver Medal
8.	Best Five Shearling Ewes or Gimmers, ...	Eight Sovereigns
	Second best, . . .	Four Sovereigns
	Third best, . . .	Medium Silver Medal

BLACKFACED.

9.	Best Tup not above four shear, .	Ten Sovereigns
	Second best, . . .	Five Sovereigns
	Third best, . . .	Medium Silver Medal
10.	Best Dinmont or Shearling Tup, .	Ten Sovereigns
	Second best, . . .	Five Sovereigns
	Third best, . . .	Medium Silver Medal
11.	Best Five Ewes not above four shear, ...	Eight Sovereigns
	Second best, . . .	Four Sovereigns
	Third best, . . .	Medium Silver Medal
	Best Pen of Lambs shown with Ewes, ...	Silver Medal
12.	Best Five Shearling Ewes or Gimmers, ...	Eight Sovereigns
	Second best, . . .	Four Sovereigns
	Third best, . . .	Medium Silver Medal

SOUTHDOWN.

13.	Best Tup not above four shear, .	Ten Sovereigns
	Second best, . . .	Five Sovereigns
	Third best, . . .	Medium Silver Medal
14.	Best Five Ewes not above four shear, or Gimmers, . .	Eight Sovereigns
	Second best, . . .	Four Sovereigns
	Third best, . . .	Medium Silver Medal

LONG-WOOLLED OTHER THAN LEICESTER.

15.	Best Tup not above four shear, .	Ten Sovereigns
	Second best, . . .	Five Sovereigns
	Third best, . . .	Medium Silver Medal

SECTION

16. Best Five Ewes not above four shear, or Gimmers, . . Eight Sovereigns.
Second best, . . . Four Sovereigns
Third best, . . . Medium Silver Medal

SHORT-WOOLLED OTHER THAN SOUTHDOWN.

17. Best Tup not above four shear, . Ten Sovereigns
Second best, . . . Five Sovereigns
Third best, . . . Medium Silver Medal
18. Best Five Ewes not above four shear, or Gimmers, . . Eight Sovereigns
Second best, . . . Four Sovereigns
Third best, . . . Medium Silver Medal

EXTRA SHEEP.

19. Best Five Cheviot Wethers not above 3 shear, . . . Six Sovereigns
Second best, . . . Three Sovereigns
Third best, . . . Medium Silver Medal
20. Best Five Blackfaced Wethers not above 4 shear, . . Six Sovereigns
Second best, . . . Three Sovereigns
Third best, . . . Medium Silver Medal
21. Best Five Cross-bred Wethers not above 3 shear, . . . Six Sovereigns
Second best, . . . Three Sovereigns
Third best, . . . Medium Silver Medal

CLASS IV.—SWINE.

1. Best Boar, large breed, . . Eight Sovereigns
Second best, . . . Four Sovereigns
Third best, . . . Medium Silver Medal
2. Best Boar, small breed, . . Eight Sovereigns
Second best, . . . Four Sovereigns
Third best, . . . Medium Silver Medal
3. Best Sow, large breed, . . Six Sovereigns
Second best, . . . Three Sovereigns
Third best, . . . Medium Silver Medal
4. Best Sow, small breed, . . Six Sovereigns
Second best, . . . Three Sovereigns
Third best, . . . Medium Silver Medal
5. Best Pen of three Pigs, not exceeding 8 months old, large breed, Four Sovereigns
Second best, . . . Two Sovereigns
Third best, . . . Medium Silver Medal

SECTION

6. Best Pen of three Pigs, not exceeding 8 months old, small breed, Four Sovereigns
Second best, . . . Two Sovereigns
Third best, . . . Medium Silver Medal

EXTRA STOCK.

Animals not included in the Sections for Competition may be exhibited as Extra Stock, and will receive Honorary Premiums when specially commended.

CLASS V.—POULTRY.

SECTION

SILVER GREY DORKING.

1. Best Cock and 2 Hens, . . . Silver Medal
Second best, . . . Bronze Medal
2. Best Cockerel and 2 Pullets, . . Silver Medal
Second best, . . . Bronze Medal

COLOURED DORKING.

3. Best Cock and 2 Hens, . . . Silver Medal
Second best, . . . Bronze Medal
4. Best Cockerel and 2 Pullets, . . Silver Medal
Second best, . . . Bronze Medal

WHITE DORKING.

5. Best Cock and 2 Hens, . . . Silver Medal
Second best, . . . Bronze Medal
6. Best Cockerel and 2 Pullets, . . Silver Medal
Second best, . . . Bronze Medal

COLOURED COCHIN-CHINA.

7. Best Cock and 2 Hens, . . . Silver Medal
Second best, . . . Bronze Medal
8. Best Cockerel and 2 Pullets, . . Silver Medal
Second best, . . . Bronze Medal

WHITE COCHIN-CHINA.

9. Best Cock and 2 Hens, . . . Silver Medal
Second best, . . . Bronze Medal
10. Best Cockerel and 2 Pullets, . . Silver Medal
Second best, . . . Bronze Medal

PENCILLED BRAMAHPOOTRA.

11. Best Cock and 2 Hens, . . . Silver Medal
Second best, . . . Bronze Medal
12. Best Cockerel and 2 Pullets, . . Silver Medal
Second best, . . . Bronze Medal

SECTION — LIGHT BRAMAHPOOTRA.

13. Best Cock and 2 Hens, . . . Silver Medal
Second best, ... Bronze Medal
14. Best Cockerel and 2 Pullets, . . Silver Medal
Second best, ... Bronze Medal

MALAY.

15. Best Cock and 2 Hens, . . . Silver Medal
Second best, ... Bronze Medal
16. Best Cockerel and 2 Pullets, . . Silver Medal
Second best, ... Bronze Medal

SPANISH.

17. Best Cock and 2 Hens, . . . Silver Medal
Second best, ... Bronze Medal
18. Best Cockerel and 2 Pullets, . . Silver Medal
Second best, ... Bronze Medal

SCOTCH GREY.

19. Best Cock and 2 Hens, . . . Silver Medal
Second best, ... Bronze Medal
20. Best Cockerel and 2 Pullets, . . Silver Medal
Second best, ... Bronze Medal

GOLDEN PENCILLED HAMBURG.

21. Best Cock and 2 Hens, . . . Silver Medal
Second best, ... Bronze Medal
22. Best Cockerel and 2 Pullets, . . Silver Medal
Second best, ... Bronze Medal

SILVER PENCILLED HAMBURG.

23. Best Cock and 2 Hens, . . . Silver Medal
Second best, ... Bronze Medal
24. Best Cockerel and 2 Pullets, . . Silver Medal
Second best, ... Bronze Medal

GOLDEN SPANGLED HAMBURG.

25. Best Cock and 2 Hens, . . . Silver Medal
Second best, ... Bronze Medal
26. Best Cockerel and 2 Pullets, . . Silver Medal
Second best, ... Bronze Medal

SILVER SPANGLED HAMBURG.

27. Best Cock and 2 Hens, . . . Silver Medal
Second best, ... Bronze Medal
28. Best Cockerel and 2 Pullets, . . Silver Medal
Second best, ... Bronze Medal

SECTION WHITE CRESTED BLACK POLISH.

29. Best Cock and 2 Hens, . . . Silver Medal
Second best, ... Bronze Medal
30. Best Cockerel and 2 Pullets, . . Silver Medal
Second best, ... Bronze Medal

GOLDEN SPANGLED POLISH.

31. Best Cock and 2 Hens, . . . Silver Medal
Second best, ... Bronze Medal
32. Best Cockerel and 2 Pullets, . . Silver Medal
Second best, ... Bronze Medal

SILVER SPANGLED POLISH.

33. Best Cock and 2 Hens, . . . Silver Medal
Second best, ... Bronze Medal
34. Best Cockerel and 2 Pullets, . . Silver Medal
Second best, ... Bronze Medal

GAME—BLACK OR BROWN REDS.

35. Best Cock and 2 Hens, . . . Silver Medal
Second best, ... Bronze Medal
36. Best Cockerel and 2 Pullets, . . Silver Medal
Second best, ... Bronze Medal

GAME—DUCKWINGS.

37. Best Cock and 2 Hens, . . . Silver Medal
Second best, ... Bronze Medal
38. Best Cockerel and 2 Pullets, . . Silver Medal
Second best, ... Bronze Medal

ANY OTHER VARIETY OF GAME.

39. Best Cock and 2 Hens, . . . Silver Medal
Second best, ... Bronze Medal
40. Best Cockerel and 2 Pullets, . . Silver Medal
Second best, ... Bronze Medal

BANTAMS—*Game.*

41. Best Cock and 2 Hens, . . . Silver Medal
Second best, ... Bronze Medal
42. Best Cockerel and 2 Pullets, . . Silver Medal
Second best, ... Bronze Medal

BANTAMS—*Gold-laced Sebright.*

43. Best Cook and 2 Hens, . . . Silver Medal
Second best, ... Bronze Medal
44. Best Cockerel and 2 Pullets, . . Silver Medal
Second best, ... Bronze Medal

SECTION BANTAMS—*Silver-laced Sebright.*

45. Best Cock and 2 Hens, . . . Silver Medal
Second best, ... Bronze Medal
46. Best Cockerel and 2 Pullets, . . Silver Medal
Second best, ... Bronze Medal

ANY OTHER VARIETY OF BANTAMS.

47. Best Cock and 2 Hens, . . . Silver Medal
Second best, ... Bronze Medal
48. Best Cockerel and 2 Pullets, . . Silver Medal
Second best, ... Bronze Medal

ANY OTHER DISTINCT BREED OF POULTRY.

49. Best Cock and 2 Hens, . . . Silver Medal
Second best, ... Bronze Medal
50. Best Cockerel and 2 Pullets, . . Silver Medal
Second best, ... Bronze Medal

CAPONS—*Of any Breed.*

51. Best 3 Capons, ... Silver Medal
Second best, ... Bronze Medal

DUCKS—*White Aylesbury.*

52. Best Drake and 2 Ducks, . . . Silver Medal
Second best, ... Bronze Medal
53. Best Drake and 2 Ducklings, . . Silver Medal
Second best, ... Bronze Medal

DUCKS—*Rouen.*

54. Best Drake and 2 Ducks, . . . Silver Medal
Second best, ... Bronze Medal
55. Best Drake and 2 Ducklings, . . Silver Medal
Second best, ... Bronze Medal

DUCKS—*Any other Distinct Breed.*

56. Best Drake and 2 Ducks, . . . Silver Medal
Second best, ... Bronze Medal
57. Best Drake and 2 Ducklings, . . Silver Medal
Second best, ... Bronze Medal

TURKEYS—*Black Norfolk.*

58. Best Cock and 2 Hens, . . . Silver Medal
Second best, ... Bronze Medal
59. Best Cock and 2 Hens (Poults), . . Silver Medal
Second best, ... Bronze Medal

Section		
	TURKEYS—*Any other Breed.*	
60.	Best Cook and 2 Hens, . . .	Silver Medal
	Second best, ...	Bronze Medal
61.	Best Cock and 2 Hens (Poults), . .	Silver Medal
	Second best, ...	Bronze Medal
	GEESE—*Grey Toulouse.*	
62.	Best Gander and 2 Geese, . .	Silver Medal
	Second best, ...	Bronze Medal
63.	Best Gander and 2 Goslings, . .	Silver Medal
	Second best, ...	Bronze Medal
	GEESE—*Embden.*	
64.	Best Gander and 2 Geese, . .	Silver Medal
	Second best, ...	Bronze Medal
65.	Best Gander and 2 Goslings, . .	Silver Medal
	Second best, ...	Bronze Medal

CLASS VI.—IMPLEMENTS.

NOTE.—Premiums for Implements and Machinery have been withdrawn, and trials, during the currency of a Show, discontinued, in terms of a report approved of by a General Meeting of the Society on 21st January 1863. Reference is made to General Regulations 33, 34, and 35, for the terms on which Implements may now be exhibited, and the conditions under which they will be tried and rewarded.

REGULATIONS.

GENERAL CONDITIONS.

1. Members of the Society are admitted to the Show-Yard without payment, on exhibiting a "*Member's Ticket*," except during the inspection by the Judges, when 5s. will be charged. Tickets will be sent to all Members residing in the District connected with the Show—the counties of Aberdeen, Banff, Kincardine, and eastern division of Forfar. Members residing in other localities must apply for Tickets at the Secretary's Office, 3 George IV. Bridge, Edinburgh, *not later than the 18th of July.*

2. Stock must be the property and in the possession of the Exhibitor from the date of the Entry.

3. Each column in the schedule of Entry must be filled up so far as within the knowledge of the Exhibitor.

4. Stallions and aged Bulls must have had produce, and, along with Two-year-old Bulls, have served within the year of the Show.

5. All Cows must have had calves previous to the Show, and when exhibited, they must either be in milk or in calf; if in milk, birth must have

been within 9 months of the Show; if in calf, birth must be certified within 4 months after the Show.

6. Two-year-old Heifers—of the Short-horn and Polled Breeds—must be in calf when exhibited, and birth must be certified within 9 months after the Show

7. Mares in Section 5 must have produced foals after 1st January 1868, and foals must be at foot, except when death can be proved. Mares in Section 6 must be in foal, and awards will be suspended till birth is certified.

8. All Ewes must have reared Lambs in 1868; and Ewes in Sections 7 and 11 (Cheviot and Blackfaced) must be in milk, and have their Lambs at foot. Fleeces must not be artificially coloured.

9. The Pigs in Sections 5 and 6 must belong to the same litter, and be uncut.

10. An animal which has gained a first premium at a General Show of the Society cannot again compete in the same section.

11. No animal shall bear on its rug, harness, pail, or other fittings, any initial, crest, or mark of ownership, nor be distinguished otherwise than by the number indicating its place in the Catalogue.

12. Except for extra Stock, Commendations will only be given for one lot in each Section—the fourth in merit.

13. The violation by an Exhibitor of any one of the Regulations will involve the forfeiture of all Premiums awarded to him.

14. Should it be proved to the satisfaction of the Directors that an animal has been entered under a false name, pedigree, or description, for the purpose of misleading the Directors or Judges as to its qualification or properties, the case shall be reported to the first General Meeting, in order that the Exhibitor shall be disqualified from again competing at the Society's Shows, and his name, if he be a Member, struck from the roll.

15. When an animal has previously been disqualified by the decision of any Agricultural Association in Great Britain or Ireland, such disqualification shall attach, if the Exhibitor, being aware of the disqualification, fail to state it, and the grounds thereof, in his entry, to enable the Directors to judge of its validity.

16. Protests against the awards of the Judges must be lodged with the Secretary not later than 10 A.M. on Wednesday, 29th July, and parties must be in attendance at the Committee-Room, in the Show-Yard, at 12, when protests will be disposed of.

17. The Society shall not be liable for any loss or damage which Stock, Implements, or other articles may sustain at the Show, or in consequence of having been sent to it.

18. The decisions of the Board of Directors are final in all questions respecting Premiums, and it shall not be competent for any Exhibitor to appeal against such decisions to, nor seek redress in respect of them from any other tribunal.

19. The Premiums awarded will be paid after the 1st November 1868, and may be taken either in money or in plate.

CERTIFICATES OF ENTRY FOR STOCK.

20. Every Lot must be intimated by a Certificate of Entry, lodged with the Secretary *not later than Friday the 12th of June.* Printed forms will be issued on application to the Secretary, or to Messrs J. and R. LIGERTWOOD, 89 Union Street, Aberdeen.

21. Admission-Orders to the Yard for Stock and Servants will be forwarded by post previous to the Show.

STALL RENT.

22. Covered accommodation will be provided for the whole of the Stock

and the following rates shall be paid by Exhibitors at the time of making their Entries :—

	Members.		Non-Members.	
	s.	*d.*	*s.*	*d.*
Stallions—3 year old—and 2 year old entire Colts, ...	10	0	20	0
All other Horses and Cattle 2 years old and upwards, ...	7	6	15	0
Yearling Colts, Fillies, Bulls, and Heifers and Calves, ...	5	0	10	0
Sheep and Swine, per pen, . . .	5	0	10	0
Poultry, per coop, ...	1	6	2	6

ADMISSION OF STOCK.

23. The Yard will be open for Stock on Saturday, 25th July, and Monday, 27th July, and between Six and Eight o'clock on the morning of Tuesday the 28th of July, after which hour no Stock can be admitted.

24. One Servant will be admitted in charge of each Lot. Bulls must be secured by a nose ring, with chain or rope attached.

25. Cattle, Sheep, or Swine cannot be removed from the Yard till Five P.M. on Thursday, 30th July, except on certificate by the Veterinary Surgeon employed by the Directors.

26. Horses may be withdrawn at Six each evening on a deposit of £2 for each animal, which shall be forfeited if the animal is not brought back at Seven o'clock the following morning.

27. Servants in charge of Stock must bring their own buckets or pails. A first bedding for Horses, Cattle, and Swine, will be provided by the Society, but all other fodder and food for Stock will be supplied, at fixed prices hereafter to be published, by a Contractor employed by the Society. Any Servant removing bedding from an adjoining stall will be fined in double the amount taken. Exhibitors may fetch their own cake or corn to the Yard, but not grass, hay, nor straw.

PLACING AND JUDGING STOCK.

28. On Tuesday, 28th July, Exhibitors, and all others except Servants in charge of Stock, must leave the Yard at Eight A.M. The Judges will commence their inspection at Nine o'clock, when the public will be admitted. There shall be no award unless the Judges deem the animals to have sufficient merit, more especially if there is only one lot in a Section ; and it shall be in their power to suggest the removal of any lot which appears to them unworthy of being placed in the Yard.

29. Two Members of Committee will attend each Section of the Judges. It will be their duty to see that no obstruction is offered to them, and that the space reserved for them is not encroached on ; to communicate to the Secretary any question that may arise for the consideration of the Committee ; to complete their reports ; and to ticket the prize animals.

30. It shall not be competent for any Exhibitor, nor for his Factor or Land-Steward, to act as a Judge or Attending Member in any class in which he is competing ; and no Exhibitor shall remain in charge of any lot, whether belonging to himself or another, while the Judges are in the Yard.

ADMISSION OF PUBLIC.

31. The public will be admitted to the Stock-Yard on Tuesday at 9 A.M., immediately before the inspection by the Judges commences. Holders of Members' tickets, and Exhibitors of Stock, will be charged 5s. for admission to the judging ; all others 10s. The space reserved for the Judges will be enclosed by ropes, and no encroachment will be permitted.

32. After 2 P.M. on Tuesday, Holders of Members' Tickets and Exhibitors will be admitted free. The charges to others will be—Tuesday, after 2 P.M., 2s. 6d.; Wednesday, from 8 A.M. till 1 P.M., 2s. 6d., and after 1 P.M., 1s.; Thursday, from 8 A.M. till 5 P.M., 1s. The Implement Yard will be open on Tuesday forenoon while the Stock is being judged; holders of Members' Tickets and Exhibitors admitted free; others at 2s. 6d.; thereafter one payment admits to both Yards.

ENTRY OF IMPLEMENTS.

33. All articles must be entered with the Secretary on or before 12th June, and Exhibitors must intimate whether they wish their goods placed under cover or not, and specify the space they require. Shedding will be charged 1s. 6d. per lineal foot of frontage, with a depth of 20 feet, to Members, and 2s. to Non-members.

34. Members may show Implements free if shedding is not required, and Non-members will be charged sixpence per lineal foot of frontage, with a depth of 20 feet.

35. When an Implement or Machine is supposed to embrace a new invention, or radical improvement, the nature of such must be specified in the entry, to enable the Directors to order an inspection with a view to a trial. Such trial, when recommended by the inspecting Committee, will be instituted in a convenient locality, and at a season of the year suitable for the operation of the implement or machine, which, when thoroughly tested, will be entitled to such a Premium as the Directors may see fit to award, on the report of the Judges employed by them.

PLACING IMPLEMENTS IN THE YARD.

36. The Yard will be open for the reception of Implements on Tuesday, 21st July, and till Monday evening, 27th July.

37. There must be attached to each Implement, when forwarded to the Show, a label bearing the Exhibitor's name, and that of the Implement.

38. The articles of each Exhibitor will be all placed in one stand.

39. All articles must remain in the Yard till Five P.M. on Thursday, the 30th July, and may be kept there till the afternoon of Friday.

PLACING AND JUDGING POULTRY.

40. Poultry must be brought to the Show-Yard on Monday, 27th July, or between Six and Eight o'clock on the morning of 28th July. No lot will be admitted without an Admission-order. Coops, food, and attendance will be found by the Society.

41. No lot to be removed from the Yard till Five P.M. on Thursday, the 30th July.

Premium Lists, Certificates of Entry, and Regulations, may be obtained by applying at the Secretary's Office, No. 3 George IV. Bridge, Edinburgh, or to Messrs J. & R. LIGERTWOOD, 89 Union Street, Aberdeen.

The Secretary will be at the Royal Hotel, Aberdeen, on Thursday and Friday, 11th and 12th June, to close the List.

GENERAL SHOW OF STOCK AND IMPLEMENTS

AT

EDINBURGH, 1869.

Premiums will be offered for the following Classes:—

CATTLE.

SHORT-HORN.

Bulls calved before 1st January 1867
Bulls calved after 1st January.....1867
Bulls calved after 1st January.....1868
Cows of any age.
Heifers calved after 1st January 1867
Heifers calved after 1st January 1868

POLLED ANGUS OR ABERDEEN.

Bulls calved before 1st January 1867
Bulls calved after 1st January.....1867
Bulls calved after 1st January.....1868
Cows of any age.
Heifers calved after 1st January 1867
Heifers calved after 1st January 1868

POLLED GALLOWAY.

Bulls calved before 1st January 1867
Bulls calved after 1st January.....1867
Bulls calved after 1st January.....1868
Cows of any age.
Heifers calved after 1st January 1867
Heifers calved after 1st January 1868

AYRSHIRE.

Bulls calved before 1st January 1867
Bulls calved after 1st January.....1867
Cows in milk of any age.
Cows in calf of any age.
Heifers calved after 1st January 1867
Heifers calved after 1st January 1868

HIGHLAND.

Bulls calved before 1st January 1866
Bulls calved after 1st January.....1866
Bulls calved after 1st January.....1867
Cows of any age.
Heifers calved after 1st January 1866
Heifers calved after 1st January 1867

FAT STOCK.

Polled Oxen calved after 1st January 1866
Polled Oxen calved after 1st January... 1867
Highland Oxen calved after 1st January.....1865
Highland Oxen calved after 1st January.....1866
Oxen of any other pure or cross breed calved after 1st January 1866
Oxen of any other pure or cross breed calved after 1st January 1867
Cross-bred Heifers calved after 1st January 1866
Cross-bred Heifers calved after 1st January 1867

HORSES

For Agricultural Purposes.

Stallions foaled before 1st January 1866
Entire Colts foaled after 1st January 1866
Entire Colts foaled after 1st January 1867
Entire Colts foaled after 1st January 1868
Mares with foal at foot, foaled before 1st January.....1866
Mares in foal, foaled before 1st January 1866
Fillies foaled after 1st January.....1866
Fillies foaled after 1st January.....1867
Fillies foaled after 1st January.....1868

EXTRA.

Mares or Geldings, foaled before 1st January 1865, suitable for field.
Mares or Geldings, foaled between 1st January 1865 and 1st January 1866, suitable for field.
Mares or Geldings, foaled between 1st January 1866 and 1st January 1867, suitable for field.
Mares or Geldings, foaled before 1st January 1865, suitable for harness.
Draught Mares or Geldings in harness.

SHEEP.

LEICESTER.

Tups not more than four shear.
Dinmont or Shearling Tups.
Ewes not more than four shear.
Shearling Ewes or Gimmers.

BORDER LEICESTER.

Tups not more than four shear.
Dinmont or Shearling Tups.
Ewes not more than four shear.
Shearling Ewes or Gimmers.

CHEVIOT.

Tups not more than four shear.
Dinmont or Shearling Tups.
Ewes not more than four shear.
Shearling Ewes or Gimmers.

BLACKFACED.

Tups not more than four shear.
Dinmont or Shearling Tups.
Ewes not more than four shear.
Shearling Ewes or Gimmers.

SOUTHDOWN AND OTHER SHORT-WOOLLED.

Tups not more than four shear.
Dinmont or Shearling Tups.
Ewes not more than four shear.
Shearling Ewes or Gimmers.

LONG-WOOLLED OTHER THAN LEICESTER.

Tups not more than four shear.
Ewes not more than four shear, or Gimmers.

NOTE.—*Ewes and Gimmers to be exhibited in pens of five, and in the Cheviot and Blackfaced Breeds, Ewes must be in milk with lambs at foot.*

SWINE.

Boars, large breed.	Sows, large breed.
Boars, small breed.	Sows, small breed.

Pigs not exceeding 8 months old, large breed.
Pigs not exceeding 8 months old, small breed.

NOTE.—*Pigs to be exhibited in pens of three.*

POULTRY.

COCK and TWO HENS, COCKEREL and TWO PULLETS, of each of the following breeds :—

Silver-Grey Dorking.	Silver Pencilled Hamburg.
Coloured Dorking.	Golden Spangled Hamburg.
White Dorking.	Silver Spangled Hamburg.
Coloured Cochin-China.	White-crested Black Polish.
White Cochin-China.	Golden Spangled Polish.
Pencilled Brahmapootra.	Silver Spangled Polish.
Light Brahmapootra.	Game—Black or Brown Reds.
Malay.	Game—Duckwings.
Spanish.	Game—Any other variety.
Scotch Grey.	Bantams—Game.
Golden Pencilled Hamburg.	Bantams—Gold-laced Sebright.

POULTRY—*continued.*

Bantams—Silver-laced Sebright.
Bantams—Any other variety.
Any other distinct Breed of Poultry.
Ducks—White Aylesbury.
Ducks—Rouen.
Ducks—Any other distinct Breed.
Turkeys—Black Norfolk.
Turkeys—Any other Breed.
Geese—Grey Toulouse.
Geese—Embden.
Capons (coops of three).

VETERINARY COLLEGE.

The Veterinary College of Edinburgh was established by the Society in 1823, and was conducted by Professor Dick from that date till the period of his death in April 1866. During that time the Society has issued Certificates or Diplomas to 821 Students of the College, who had passed the Examinations instituted by the Board of Directors.

The late Professor Dick at his decease endowed the College, and bequeathed it in trust to the Lord Provost, Magistrates, and Councillors of the City of Edinburgh, continuing to the Society the power to appoint Examiners.

The establishment is now conducted by Professor Williams, assisted by Dr Allan Dalzell, Dr Young, Mr Strangeways, Mr Worthington, and Mr M'Bride, who holds the chair of Cattle Pathology, established by the Society. The curriculum embraces the Principles and Practice of Veterinary Medicine and Surgery, with Anatomy, Physiology, and Demonstrations; Cattle Pathology; Chemistry; Materia Medica and Dietetics; and the general management of domesticated Animals.

Students have the advantage of assisting in an extensive practice, and of performing the different operations which most frequently occur.

Attendance on Two Courses is required before a Student can be taken upon trial for Diploma by the Society.

The examinations are conducted by leading members of the Medical Faculty and of the Veterinary Profession; and a Diploma bearing the arms of the Society, and signed by the Examiners, is granted to those Students who pass the required examinations.

Graduates of the College are eligible for appointment as Veterinary Surgeons in her Majesty's service.

The Session commences in the beginning of November, and is concluded before the end of April following.

AGRICULTURAL EDUCATION.

The following Bye-Laws were enacted in 1866, under the authority of the Supplementary Charter of 1856, and in terms of a Report by the Council on Education adopted January 1865:—

BYE-LAWS.

I. That in terms of a report by the Council on Education the following Board of Examiners be appointed:—

Science and Practice of Agriculture—Mechanics and Construction.—Professor Wilson; George Hope, Fenton Barns; Robert Russell, Pilmuir; and John Wilson, Edington Mains.

Botany.—Professor Balfour.

Chemistry.—Professor Anderson.

Natural History.—Professor Allman.

Veterinary Surgery.—Professor Williams.

Field Engineering and Surveying.—Professor Macquorn Rankine and David Stevenson, C.E.

Book-Keeping and Accounts.—Kenneth Mackenzie, C.A., and Archibald Paterson, Meadowfield.

II. That the examination shall be both written and oral; that the value of the answers shall be determined by numbers; and that the oral examination shall be public.

III. That there shall be two examinations, to be styled respectively the "Certificate Examination," and the "Diploma Examination." The first to be open to candidates not less than eighteen years of age; the second to those who have completed twenty-one years.

IV. That to pass the "Certificate Examination" a candidate must be acquainted with farm accounts, mensuration, and surveying, and must possess a good knowledge of practical agriculture, and a general acquaintance with the elements of botany, chemistry, and natural history.

V. That a certificate in the following terms, signed by the President or Vice-President of the Council on Education, and by the Secretary, shall be granted to candidates passing this examination:—

"We hereby certify that on the A. B. was examined, and has been found to possess a knowledge of farm accounts, mensuration, and surveying, a good knowledge of practical agriculture, and a general acquaintance with the elements of botany, chemistry, and natural history, and that he is therefore entitled to present himself for the further examination, in terms of the regulations, for the Society's diploma."

VI. That to pass the "Diploma Examination" a candidate must be in possession of the certificate, and have attained his

twenty-first year, and must be found to possess a thorough knowledge of the theory and practice of agriculture; of mechanics and mensuration; of the physiology and treatment of domesticated animals; and of the application of botany, chemistry, and natural history to agriculture.

VII. That a diploma in the following terms, bearing the corporate seal of the Society, and signed by the President or Vice-President of the Council on Education, and by the Secretary, shall be granted to candidates passing the second examination:—

"These are to certify that, on the day of A. B. was examined in the arts and sciences connected with agriculture, and has been reported to be proficient therein by a Board of Examiners nominated by the Council of the Highland and Agricultural Society of Scotland on Education, in terms and by authority of a Charter, given under the Great Seal, on the 18th day of August 1856."

VIII. That a sum not exceeding £100 per annum shall be placed at the disposal of the Examiners, to be applied in prizes to candidates who pass with distinguished merit, and on a standard exceeding that required for the diploma.

The following Gentlemen have passed Examinations:—

For Diploma.

1. Jacob Wilson, Woodhorn Manor, Morpeth, . . 1858.
2. John Milne, Mains of Laithers, Turriff, . . . 1859.
3. William Henry Eley, Cobham, Kent, . . . 1859.
4. Thomas Rome, Groundslow, Staffordshire, . . 1859.
5. William Norman, Ouchterside, Carlisle, . . . 1860.
6. George Campbell, Balbrogie, Coupar-Angus, . . 1861.
7. William B. Smith, Stoneleigh Villa, Leamington, . 1862.
8. John R. Hetherington, Carlisle, ... 1862.
9. William Brown, jun., Edderstone, Peebles, . . 1864.
10. Arthur James Hill, Bath, ... 1864.

For Certificate and Diploma

(*Under Bye-Laws enacted in* 1866).

11. R. H. Goddard, Newcastle-on-Tyne, . . . 1866.
12. G. Y. Wall, jun., Durham, ... 1866.
13. Robert Brydon, Burncastle, Berwickshire, . . 1867.
14. George Kent Walton, Long Campton, Warwickshire, 1867.

For Certificate

(*Under Bye-Laws enacted in* 1865).

1. J. C. Bowstead, Halkthorpe Hall, Penrith, . . 1867.
2. Thomas John Elliot, Wilton, Salisbury, . . . 1867.

CHEMICAL DEPARTMENT.

The objects of the Chemical Department are threefold :—

I. The prosecution of researches in various subjects connected with Agricultural Chemistry, the results of which are published at intervals in the Transactions.

Dr Anderson will be glad at all times to receive suggestions from Members of the Society regarding subjects they may consider worthy of investigation, and which will be laid before the Chemical Committee.

II. To assist in the performance of minute and accurate Field Experiments.

For this purpose it has recently been resolved to institute field experiments on a systematic plan, and in such a manner as to obtain exact and comparable results. The experiments will be conducted in different districts under the superintendence of a Committee, who will fix the precise nature of those to be made in each year, and see that the precautions required to secure accuracy are properly attended to. The furnishing the requisite chemical data for these researches will in future form an important part of the business of the laboratory. Gentlemen who have any suggestions to make regarding subjects deserving investigation are requested to communicate with Dr Anderson.

III. The performance of Analyses of Manures, Soils, Vegetable Products, &c., for Members of the Society at reduced fees.

In purchasing manures, cattle foods, &c., Members are recommended, in all cases, to do so by guaranteed analyses, and to ascertain that the article delivered corresponds with it. Partial analyses, such as Nos. 6 and 7 of the accompanying list, will generally suffice to check the correspondence of the stock with the guarantee, and give an *approximate* though not a precise estimate of its value. When an *exact* estimate is required, a complete analysis is necessary.

Samples intended for analysis should be sent (carriage paid) addressed to Dr ANDERSON, 15 SHUTTLE STREET, GLASGOW, and when of small size, they are most cheaply and expeditiously forwarded *by post*. They should be distinctly labelled, marked with the name and address of the sender in full, and accompanied by a letter, specifying the particular analysis required, according to its number in the following list,—and, if possible, the object in view,—as, by doing so, much trouble and delay will occasionally be saved.

Some inconvenience having been experienced by persons sending samples for Analysis which had not been selected with sufficient care, and were afterwards found not to represent the average composition of the substance, it is particularly requested that the following instructions may be attended to as closely as circumstances will permit.

INSTRUCTIONS FOR SELECTING SAMPLES FOR ANALYSIS.

Manures.—A large double handful of the Manure should be taken from each of *at least* five or six different bags; and if any lumps are found in it, a due proportion of these should also be taken. The whole being laid on a large sheet of paper, should be carefully mixed by rubbing with the hand, the lumps being broken down and mixed as uniformly as possible with the powdery part. If this mixture be carefully made, a quantity of it not exceeding *two ounces* will suffice for the analysis. It should be folded up in tinfoil to prevent its becoming dry. In default of tinfoil, the sample may be wrapped in double folds of strong writing paper. Should the manure contain stones, or be very moist, or should any difficulty be experienced in making a uniform mixture, it is desirable that *two or three pounds* should be sent.

Soils.—In selecting Soils for analysis, five or six spadefuls should be taken from different parts of the field, and after being spread out in a thin layer for several days to dry, should be put two or three times through a fine sieve, so as to insure uniform mixture. For a complete analysis, not less than *two pounds* should be sent; for a partial analysis, three or four ounces will be sufficient.

Waters.—For the complete analysis of a Water, from *two to three gallons* are required; for the determination of the amount of salts in solution, and lime thrown down by boiling, *two quarts* will suffice, A well water may be selected at any time; but the water of a spring or running stream should be taken in dry weather. The jars or bottles in which they are sent must be tightly corked and sealed. In the analysis of a mineral water, it may sometimes be desirable to determine the amount of gases held in solution; in which case certain precautions must be observed which require the presence of a chemist at the spring.

Limestones, Clays, Ironstones, &c.—If the bed of any of these substances of which the analysis is required be very uniform in appearance, a piece of two or three ounces' weight taken from any part of it will be enough for analysis; but in all cases, it is better to send three or four chips from different parts of its thickness. Sometimes where the characters of different parts of the bed vary much, separate analysis of these portions may be requisite, in which case two ounces of each may be sent.

The following are the rates at which analyses, &c., are furnished to *Members of the Society*, and it is requested that the fee be remitted along with the sample :—

1. Complete analysis of a Soil, including determination of Alkalies and Phosphates, £3.
2. A partial analysis of a Soil, such as the determination of the quantity of Organic Matter, and relative proportion of Clay, Sand, and Carbonate of Lime it contains, 10s.
3. Quantitative determination of any one ingredient of a Soil, 7s. 6d.
4. Complete analysis of Saline Manures and other substances, such as Gypsum, Nitrates of Soda and Potash, Ammoniacal Salts, Guano, Oil-cake, Bone-dust, Rape-dust, Superphosphate of Lime, £1.
5. Testing the above substances for adulterations—for each sample, 5s.
   This examination is generally sufficient to determine whether or not any of these substances are grossly adulterated, but it gives no idea of the comparative value of different Samples, where all are genuine.
6. Determination of the percentage of Phosphates and Ammonia in a Guano, 10s.
7. Determining the Quantity of Soluble and Insoluble Phosphates in a Superphosphate, 10s.
   This and the preceding determination generally suffice to show whether the sample is of fair quality, and corresponds with the analysis by which it was sold, but not to fix its exact commercial value.
8. Complete analysis of Limestone, Marl, Shell-sand, &c., £1.
9. Examining any of the above substances for the quantity of Lime, and ascertaining in the same the presence of Magnesia and Alumina, 7s. 6d.
   Ascertaining the proportion of these, 2s. 6d. additional for each substance.
10. Complete analysis of the Ash of any Plant, £3.
11. Complete analysis of a Water, £2.
12. Determination of the Amount of Salts in Solution, and of the Lime thrown down by boiling in any water, 10s.
13. Analysis of Tile or Fire Clay, £1, 10s.
14. Complete analysis of Roots, Grains, and other Vegetable Products, £1.
15. Examining products of Vegetation, or of the Dairy, such as Nutritive Matters in Wheat, or other grain—quantity of Butter or Cheese in Milk—5s. for each ingredient.
16. Determination of the quantity of Nitrogen in any substance, 7s. 6d.

17. Answers to letters asking advice on subjects within the department of the chemist, 5s.

The charges for other Analyses not specified in the list will be settled by the Committee of Management, with reference to the amount of work which they involve, and on a scale similar to the above.

F. N. MENZIES, *Secretary.*

EDINBURGH, *February* 1868.

REPORT ON THE GENERAL MANAGEMENT OF PLANTATIONS.

By C. Y. Michie, Forester, Cullen House, Cullen.

[*Premium—Five Sovereigns.*]

The following Report applies to four plantations in Scotland and one in England:—

No. 1 is a mixed plantation, situated in the south of the county of Roxburgh, thirty-two to thirty-six years planted. It was originally enclosed with a thorn hedge, which having decayed in parts, has been replaced in these parts with post and rail pailing. The form of the plantation is an irregular oblong, the greater portion extending from north to south, and is about 850 yards long, by a mean width of about 60 yards, comprising in all about 11 acres. It was formed with the object of clothing and beautifying the country, which it does, and with the further object of yielding a profitable crop of timber, which, however, has not yet been effected.

The ground, previous to being planted, was used as a grazing for cows, and was much esteemed for that purpose. In consequence of its precipitous nature, it was considered impracticable to cultivate it, some parts being so steep as to render it unsafe even for the grazing of cattle. The ground throughout is undulating, irregular, and ragged, and covered with various descriptions of grasses, mostly indicating superfluous water in the soil. The soil, like the surface of the ground, is variable, but in general may be termed tenacious clay, resting upon sandstone rock of various degrees of hardness; some parts are a light sandy loam, a few spots peat soil, and others a stiff tilly clay.

The plantation is situated at an altitude of between 250 and 350 feet above the level of the sea, and is sheltered, with the exception of the highest ridge, from the north and west winds by higher grounds, so essential to the growth of all trees, particularly larch and spruce.

The trees of which the plantation is composed are embraced in the following list:—

Oak to constitute the principal ultimate crop.

Ash to be thinned out from amongst the oaks as the last thinnings.

Elm do. do. do. do.

Sweet chestnut do. do. do.

Larch to be thinned out as first profitable thinnings, after having acted towards the hardwoods as nurses.

Scots pines to be thinned out as secondary thinnings, after acting to the hardwoods as nurses.

Spruce, a few to remain permanently to impart variety to the plantation, and act as nurses to the hardwoods, the others to be thinned out for profit.

The preceding list comprises seven different sorts of trees, in

addition to which four other varieties were planted, of which only a few specimens remain. Such a great variety naturally suggests the inquiry, Why plant so many sorts? The answer is, that at the time of planting it was not known which class of trees would succeed best; and, therefore, a great variety was planted, with the view of thinning out those that did not succeed—a practice which, though fast becoming obsolete, is still adhered to by some planters. The plantation, at the time the writer became acquainted with it, had been several times thinned. The stools upon the ground indicated that it had been planted at distances from 3½ to 4 feet apart, the hardwoods at 9 feet to 12 feet apart, and filled in with pine and firs to the former distances.

The first thinning was performed when between twelve and fifteen years planted, at which age, owing to the sheltered and otherwise favourable situation, the trees were considerably too much drawn up—an evil, probably little thought of at the time, but the effects of which can never be counteracted.

The plantation, in consequence of its conspicuous situation, and of its importance in other respects, always received its due mead of attention in the way of thinning, pruning, and protection from animals. It was always thinned when thought desirable, sometimes once in two years, at others not so often. There are no blank spots in the plantation up to the present time, which indicates, to a certain extent, that the soil is adapted for the growth of most forest trees. In one part 35 yards broad, where the soil is wet, and the trees considerably exposed to north-west winds, the pines and firs have been occasionally blown down. In this part the hardwoods are inferior to those in the rest of the plantation. Decayed trees have been of rare occurrence; during a period of fourteen years, the writer is quite certain that he has not observed above that number throughout the whole extent of the plantation, though at an early stage of their growth the larches died on a few soft mossy spots, and thus gave a double advantage to the spruces, many of which have become beautiful specimens.

In the operation of thinning, the work has always been performed with axes, and in doing so, great attention has always been paid to keep the stools low, generally quite level with the surface of the ground,—a system which, in thinning young plantations, is highly commendable for neatness, and future comfort in travelling through the plantations and clearing the wood. By this means, also, coppice-wood is almost entirely prevented from springing up after the hardwoods are cut, which in this case was considered desirable. In thinning out the spruces at an early age some were cut over at from 3 to 4 feet above the ground, which caused them to assume the habit of beautiful shrubs, and form a cover for game which cannot well be surpassed, though the latter object was not here contemplated.

So long as the trees were small, and could be cut and felled by one man in the proper place, axe work was certainly, if not the cheapest, at least the best method of thinning. But from the time the trees are 9 inches diameter at bottom, they are more economically cut by means of the saw.

The mode of thinning mixed hardwood plantations is always attended with greater difficulties than that of thinning plantations of one sort of trees, hence the great expense always entailed in doing so, and, consequently, the small returns. In thinning out a larch tree, for example, growing in the midst of hardwoods, where an open fall cannot be obtained, it is necessary to ascend the tree, either by means of a light ladder or otherwise, and the operator being provided with a hand-saw, to commence as he ascends, and clear the tree of all such branches as are likely to come in contact when falling with the standing trees. Frequently the whole of the branches, and sometimes also the top part of the tree, have to be cut off in this manner; and the trunk thus pollarded, is by means of a rope attached drawn down into the most convenient open space. It frequently happens that a tree thus situated and taken down, costs considerably more than its worth in the market. Such was found to be the case in thinning this plantation. The cost of labour was frequently more than double the value of the thinnings; and never, in any instance during the writer's experience, has the produce of those thinnings equalled, or even approached, the cost of the labour.

Before commencing the process of thinning, the trees have always been marked by the head forester, so that the best skill was brought to bear upon the operations of thinning, and the work performed in the most judicious and superior manner. At first the thinning was performed at all seasons, but of late years it has been principally done during the summer, at which season the bark is stripped from the oak and larch. The chief difficulty of thinning at this season is owing to the tenderness of the young shoots, particularly of those upon the pines and firs. Spruce are so tender and easily injured at this period of the year, that a considerable shake of the tree is quite sufficient to break off the leading top, and so disfigure the tree ever afterwards.

In consequence of no definite or separate account having been kept of the expenses or returns from this plantation alone, it is impossible to give an exact statement of such; but from notes taken during several thinnings, the labour exceeded the value by about 25 per cent. This arose partly from the difficulty of felling the firs and pines amongst the hardwoods, so as not to injure the latter, partly from the work having been done at day-wages instead of by the piece, and partly from the difficulty of clearing the ground of the wood and branches, which had to be removed at great expense, and for which no market could be found. Add

to the more frequent thinning which mixed plantations require, extra hands in consequence of the great difficulty of keeping the nurses at a proper distance from the hardwoods, and also the greater urgency of pruning, from the trees becoming almost invariably defective of branches on one side, while the growth is superabundant upon the other.

Pruning had evidently commenced about the time the plantation received its first thinning, and was for a long period performed only during autumn, winter, and spring, it being considered at that time that summer pruning was injurious to the health of the trees. Experience, however, subsequently showed that summer is the best season for pruning operations, and may be performed with greater advantage (upon most hardwood trees) during the months of June, July, and August, than during any other period. In pruning healthy trees of vigorous growth, no important difference appears at whatever season the work is performed, but upon trees of stunted growth, or in any degree sickly, the difference is at once manifest in the manner in which the inflicted wounds heal up. In winter pruning, a portion of the bark is apt to decay in the lower part of the wound, while trees of a similar description pruned in summer are freed in a great measure from this evil.

The work of pruning was performed with the common clasp pruning knife, so long as the branches were within a man's reach; and afterwards the operation was performed by means of the pruning chisel, hand-saw, and spokeshave, and the wounds, when large, were dressed with a preparation of paint, composed of white lead and oil, with the addition of a little lamp black, which, when applied, brings the part to a colour nearly resembling the bark of several sorts of hardwood trees.

The principal reasons assigned for pruning in the present case are as follows :—*First,* To secure a clean straight trunk of nearly equal thickness. *Second,* To give to each tree one single stem by relieving it of others. *Third,* To protect the leading top from others contending against it. *Fourth,* To remove all decayed branches from the trunks of the trees. *Fifth,* To reduce any excess of branches on one side, in order to balance the tree. *Sixth,* To shorten any extra long branches, so as to prevent snow and winds from breaking them. *Seventh,* To shorten or reduce any branch growing off from the main trunk at an acute angle, causing the bark to fester between the two surfaces at their junction. These are a few of the leading objects kept in view in the practice of pruning in the present case; other objects, of course, are aimed at in pruning plantations differently situated and grown for a different purpose.

The following statement shows the average actual crop upon the ground in 1864, and represents the market prices per acre of the whole at that period :

Species of Trees.	No. per Acre.	Value each.	Amount.
		s. *d.*	£ *s.* *d.*
Oaks, . . .	76	1 6	5 14 0
Ashes, . . .	12	2 0	1 4 0
Elms, . . .	20	2 0	2 0 0
S. Chestnut, .	12	2 0	1 4 0
Larch, . . .	10	7 0	3 10 0
Spruce, . . .	10	5 6	2 15 0
Scots Pine, .	10	1 6	0 15 0
	Trees per acre, 150		Value per acre, £17 12 0

The above statement represents the crop and its market value nearly, standing, and is about what it is worth at the present market price, if cut.

The various classes of trees are by no means regularly distributed over the ground; they are found closer in one part than in others, but average the above very nearly.

Ground similar to this enclosure is letting for grazing purposes at from 15s. to 20s. per acre; the plantation, however, not being at a growth at which it can properly be valued as a marketable subject, no reliable statement can now be given to show the profit or loss of it.

The next statement shows the value per acre of the plantation if, instead of being mixed as above, it were of one class of trees only, allowing them to stand at the same distance apart as they now do.

Species of Trees.	No. per Acre.	Value each.	Amount.
		s. *d.*	£ *s.* *d.*
Larch, ...	150	7 0	52 10 0
Spruce, ...	„	5 6	41 5 0
Scots Pine, . . .	„	1 6	11 5 0
Oak, ...	„	1 6	11 5 0
Ash, ...	„	2 0	15 0 0
Elm, ...	„	2 0	15 0 0
S. Chestnut, . .	„	2 0	15 0 0

The above statement, though showing the actual value per acre each class of trees would be, yet does not by any means show the value they would have been if the trees had been grown separately; for while the larch and spruce, as individual trees, would not have attained their present value, yet one-fourth the present number more would have been upon the ground than

at present exists, while the hardwoods would not only have stood one-fourth closer together upon the ground if grown unmixed, but would on an average have been of at least one-third more value. This is exemplified in several groups of pine, firs, and hardwoods growing in various parts upon the same estate unmixed; their great superiority over others that are mixed is quite apparent even to those unacquainted with woods. Indeed a case in point is to be found connected with this very plantation. At the southern extremity of it there is growing a group of hardwoods, which with the disadvantage of being lifted out of the plantation when 10 or 12 feet in height, and transplanted where they now grow, are at the present time fully one-third larger than those from amongst which they were lifted. There appears no other assignable reason for this decided superiority, except that the group referred to were unencumbered with pine and firs, and the ground kept clean.

In consequence of the whole of the plantation never having been thinned regularly throughout at one time for many years, and of no actual account having been taken of the thinnings either before or after being cut, it is only from private notes, taken at various times, that the writer has been enabled to arrive at the conclusions above stated, and which from this plantation having always been regarded as a model one, he has thought it the more essential that he should be minute in the various matters of detail.

The purposes to which the thinnings were appropriated were as follows :—Larch, when small, for net stakes; when larger, for paling stakes; and when further advanced, for gate-posts of various descriptions, repairs of steadings, &c.

Spruce were used for purposes similar to the larch (save net stakes), Scots pine and the various hardwoods (ash excepted) were, till of late years, used for fencing-posts or fuel. The root-cuts of ash, from twenty years planted, were used for axe and pick handles, &c., for which they were well adapted. Clay soil like this invariably produces ash of first-class quality, so long as it continues in a state of rapid growth; but whenever this ceases, if ash is allowed to stand, the grain of the wood very soon becomes short and brittle. The tops and inferior parts were used for fuel, for which purpose ash is deservedly esteemed. No wood burns better in the green state, particularly during frost.

A thinning of the plantation being done during the summer of 1864, an auction sale was called on 30th July, when the thinnings disposed of realised the following prices :—

Peeled oaks, per dozen, pit prop size, . . .	12s.
Ash, per dozen, useful size, ...	24s.
Elm, per do. do., ...	18s.

Larch, suitable for secondary general purposes, per dozen, 80s.
Spruce, „ „ „ „ 70s.
Scots pine, „ „ „ „ 20s.
Branches and burn-wood from 1s. 6d. to 4s. 6d. per lot (each containing about one ton), according to access for loading, description of wood, &c.

It will be observed that the sums realised at the sale for some sorts of wood (as the oaks) are below the estimated value per acre, but this is accounted for by the latter being peeled. The value of the bark is about equal to one-third that of the trees as they stand.

The state of the plantation generally is favourable, and will bear comparison with others of a mixed description and equal age, yet there is a great deficiency in value, as before stated, when contrasted with those of one class of trees. The spruces are nearly what might have been expected, and will be found to correspond in proportions to those of well-grown trees. They are mostly well clothed with branches, some of them quite to the ground; but as part of the soil and situations are unfavourable to the growth of spruce, the trees thus situated are scarcely worth half that of the others. Nothing is better calculated to prevent ground-rot in spruce than abundance of branches. Of two trees growing up side by side, one well clothed with branches, the other not, the trees on being cut as ripe will prove the truth of the above statement, at least if the subsoil is wet. The spruces are best grown in the lowest situations, where the leading top is preserved and the foliage fresh and healthy.

The larch next in order is equally proportionably developed, but is in some cases too small in girth for its height. It may seem remarkable that the spruces and larches are so well grown, while most of the other trees, particularly the oaks, are the very reverse. This arises from the circumstance of the former being the fastest growers, and from their having sufficient room for their free development wherever the ground was suitable, so that their present perfect state has been attained at the expense of their neighbours. The best larches are where the Scots pines did not at first succeed, and the best spruces where the larches decayed early.

The Scots pines suffered in many cases by the larches dashing against and destroying their leaders, but the former were mostly thinned out at an early age. Those now remaining are coarsely grown, occasioned by the system of thinning and the nature of the soil; they are likely to become large trees, but of a soft, inferior quality.

The hardwoods are in general badly grown, especially upon the best soil and sheltered places; they are tall compared with their thickness, have few branches, thin bark, and badly rooted.

Oaks of this age having the same soil and situation should have been at least on an average one-third more value, except upon a few spots where the soil is unsuitable. Most of the soil is suitable to the growth of ash, which thrives, but, like the oak, is very deficient in branches, and in value only about two-thirds of what might have been expected. A few specimens of sweet chestnut are also to be met with, being mostly on the extreme margin of the plantation; they are better grown than the general crop of hardwoods, but the soil, and especially the climate, being unsuitable, they are not likely ever to become valuable trees, in consequence of the heartwood becoming ring-shaken. What has been said of the ash almost equally applies to the elm, save that the soil is less adapted to the growth of the latter than the former, which requires both a richer and drier soil to attain perfection.

The plantation is at present sufficiently thin, as it has always been since the writer became acquainted with it. Yet the hardwoods will never attain the dimensions, nor survive to the age they otherwise would have done, had they been allowed to develop themselves when young by extending their roots and branches, nor will the crop as a whole ever be so profitable to the proprietor as it otherwise would have been under a different system of management. The best skill in future management can never restore it, seeing that the evil consists *almost entirely in the deficiency of branches*—a circumstance to which little importance is generally attached, but *wherein consists* the principal cause of success or failure in the cultivation of forest trees, more especially in reference to the age of the tree when the branches have been checked. Two adjacent trees having an equal weight of branches are often found to be in very opposite conditions as to vigour and growth, yet in both cases the trunks will have the same proportions to the branches weight for weight, and the formation and development of the trees will be in every way alike, viewed externally. In one case the tree probably retained all its necessary branches, say till thirty years' growth, at which period the trees in the plantation were allowed to close. The lower branches were then checked, but the tree having already spread its roots far and wide, goes on growing rapidly, while the branches, except near the top, are held in check. In the other case the branches were checked in infancy, as in the plantation now described, at the time the trees should have been growing freely and forming a valuable trunk, its growth is stinted, the annual layers of wood upon the trunk are small, the roots through which the tree is supported are few in number, of a penetrating rather than of a spreading nature, liable to early decay, to which the tree itself also succumbs at an early age.

This plantation is regarded by some as a model one, perfect almost in every respect, not even allowing that there is a de-

ficiency of branches, while in the writer's opinion, at least one-third of branches are wanting in one-half of the plantation, and one-fourth wanting in the other. Occasioned by over much shelter—not over-crowding, as the term generally implies, which is a widely different thing, the plantation having always been kept with a number of trees per acre upon it rather below than above that of a fair crop; at same time, owing to the naturally sheltered situation, the damp nature of the soil, and its clayey consistency, combined with the luxuriant summer herbage upon its surface, and the shading and sheltering effects of the pine and fir nurses, the unfavourable results described have been brought about.

One circumstance connected with this plantation worthy of special notice, is the regular systematic manner in which it has always been rather over than under thinned from first commencement up to the present time. In confirmation of this statement the writer would remark, that while in this case 150 trees constitute the present crop per acre, a professional man, whose writings on tree culture are well known, gives two instances of thinning like plantations of ages similar to this, the one having 365 trees upon an acre, and the other 390, being in both cases more than double the number found in this one. Thus, if the quotations are reliable, the plantation under consideration is much too thin, while, judging from the individual appearance of the hardwood trees, the inference would at once be drawn that they are not thinned enough. This false appearance is produced by too much shelter, and not, as might be supposed, by over-crowding, the principal and only true cause being pines and firs mixed promiscuously amongst the hardwoods, as nurses in a place where nature had already provided shelter sufficient. In any case where artificial shelter or nursing is necessary for the growing of hardwoods, the better plan is to group the nurses as well as the hardwoods, the former in such quantities and on such elevated and exposed parts as to produce the desired effect; at same time confining the hardwoods to the lower and more favoured places. By this means better shelter is afforded and less injury inflicted, than by the general mixed system.

No. 2 is another plantation of a general mixture in the south of Roxburghshire, planted in 1850 and 1851, situated at an altitude between 400 and 500 feet. It occupies part of a glen extending from north to south, the bottom of which is well sheltered from all points, and only the outskirts along the top of the banks are exposed; the length of the plantation is about 700 yards by a mean width of about 130 yards, comprising an area of about 20 acres. The banks on either side of the glen are too steep for conveniently cultivating them, though they were under the plough previous to being planted. A soft boggy part along the

bottom of the glen was never cultivated, owing to the presence of several springs and the general spongy softness of the ground, which is rich in mossy vegetable remains.

The plantation was originally formed with the view of affording cover for game, to beautify the appearance of the estate, and for the ultimate object of yielding a remunerative crop of hardwood timber. Though the area is small, the soil throughout the plantation is various. On the upper parts of the slopes it is a stiff reddish clay—what farmers term a wheat soil; near the bottom the soil is a sandy loam, and at the bottom what might appear a rich black loam, but which is moss well decomposed and variously mixed with the soil which has been washed down from the higher ground—the whole resting upon sandstone rock and white sand at various depths. The soil on the slopes is retentive of water; this, together with the dampness of the ground at the bottom of the glen, the rough herbage which abounds, and the sheltered situation, render the plantation what may be termed a damp one.

The plantation when formed, was in two different divisions, or of two *separate classes* of trees, each planted regularly throughout with one general mixture. Upon the soft ground all sorts died or degenerated save the spruces alone, which, in consequence of plenty of space and air, soon developed themselves to great perfection; some of them at eight years' growth were over 10 feet high, girth of stem at bottom 10 inches, spread of branches 8 feet, and were making top shoots of from 30 to 36 inches. It was, however, far different with the plantation on the sloping hard ground on the west side in particular; here one mass of trees stood which from the first grew with great rapidity. This part of the ground was under fallow at the time of planting, which promoted the early growth very considerably. The trees in a general mixed plantation at any age are never so equal in size as in that of one sort only; so in this instance the smaller ones, and those of slowest growth, as the hardwoods, were speedily overgrown by their more flourishing neighbours the larch, spruce, and Scots pines—all striving for existence, and growing at so great a rapidity, that, as a natural consequence, they very soon suffocated and maimed each other. Only eight growths were completed upon the trees of this part (10 acres), from time of planting to time when thinned; yet the plantation, with the exception of the spruces referred to, and one division almost entirely planted with larch, suffered so much that never, even under the ablest future management, can they properly recover themselves. The trees of which the plantation is composed are larch, spruce, Scots pine, oak, ash, elm, and sycamore. The two former were planted to act as nurses to the three latter, as the ultimate crop. The reason of the writer's having selected this plantation as one of the subjects of his report, was to show—

First, The evil effects of the mixing of different kinds of trees in plantations—such as the loss and damage occasioned thereby, the greater difficulty of management, the disadvantage at which the trees are grown, and the greater expense they entail.

In order to illustrate these results, the writer would endeavour to draw attention to the following particulars, such as the great proportion of slow-growing trees sacrificed by those of rapid growth overgrowing them, so that they are cut down as mere weeds before they can possibly be of useful size, or if not cut down till of useful size, the loss is still greater, as in the present case. The extra labour of thinning and clearing the thinnings out of the plantation entailed expense almost incalculable, as will subsequently appear.

The evil consequences of general mixing, in contrast with that of grouping, may be seen in this plantation. One part of it, a year younger than the other, was planted all nearly with larch, while the other part, as already shown, was of a general mixture. The soil, exposure, altitude, &c., are alike in both; yet the difference was altogether in favour of the part slightly mixed. The trees, by making allowance for the difference of age (one year), were scarcely so tall as the others, but were more proportionably grown, and without any appearance of disease, while the larches in the general mixed part were all but exclusively diseased, being covered with ulcer.

In the general mixed part the bark of the larch is black, as if dusted over with soot; numerous white insects infest them all, and ulcer is upon most of them. The spring frosts of April 1859 browned the foliage of nearly all the larches in the plantation in both parts; but while those *partially* mixed with pine and spruce soon recovered without sustaining any visible hurt, the other part, or that *completely* mixed and overcrowded, were so severely injured that most of them lost their leader, while hundreds were quite killed. The difference of effect produced seems only to be accounted for on the ground that the one part being healthy, and of vigorous growth, was able to ward off the injuries; while the other being already sickly, has no efforts to expend to promote similar results.

The Scots pines are tall compared with their thickness, badly branched, of a dark colour in the bark, and mostly infested with insects. The spruces (except upon the soft ground) are slender, with few branches, and badly rooted. The hardwoods are nearly all deficient of side branches, which is to them the greatest of all wants, many of them bare on one side, while others are without a proper leader.

Secondly, To show that a general mixed crop of trees upon good soil such as this is more difficult to manage, more easily and permanently injured than upon soil of inferior quality. This

is owing partly to the powerful tendency of a rapid growth both in respect to root, trunk, and branch, the trees not having room to spread their branches, and roots are forced to a rapid upward growth, thus producing length without thickness in proportion. Thinning in such cases retards the growth without effecting the desired object of changing its direction, except to a limited extent.

Thirdly, The proceeds arising from the first thinnings ought not to be an inducement to prolong the period of doing the work, seeing that the extra expense entailed in the performance of the work more than absorbs the profit; while the trees are, by such means, so far injured in their growth as to be ever afterwards a second-rate crop. It cannot be too strongly recommended to thin the first time with only one object in view, that of benefiting the future crop.

Fourthly, Although the operations of thinning were performed rather before than after the usual time for doing such work, yet the mixing system has, in this instance, proved a considerable failure, demonstrating very clearly that a system of general mixing of trees is always attended with less success than that of judicious grouping whenever the management requisite for each is strictly attended to.

On examination of the plantation previous to thinning it, the following were about the general proportions and distribution of the trees upon the ground per acre :—

Hardwoods of sorts, . . .	500
Larch, ...	1000
Spruce, ...	700
Scots pines, ...	800
	3000

The work of first thinning was performed in September 1858, beginning the operations by marking all the live trees to be taken out, and giving instructions to the workmen to cut all decayed ones, which saved the labour of marking. The cutting was performed by eight men and a boy. The foreman in direct charge of the work wrought also as one of the men, being chiefly engaged marking immediately before them, or pruning close behind them. In consequence of the smallness of the trees, and their closeness together, considerable difficulty was experienced in using the axes. *Hand bills,* therefore, were used instead,—instruments which, when properly made, and in the hands of experienced workmen, are much superior to axes for thinning small wood.

To prevent any misconception in reference to the hand bill, I may mention that it is not the instrument purchased from iron-

mongers under that name, with sharp edge on back and front, which is, in comparison, but a feeble instrument. The difference and advantage of the one over the other can only be found out in using it.

Pruning was performed at the same time as the thinning, and cost 5s. per acre, or 1s. per 100 trees. The principal requirements in pruning here were to relieve double stems, double tops, to clear the trunks of lateral branches to one-third of their height, to remove decayed branches, and to cut over injured or decayed trees.

Owing to the sickly and generally unhealthy state of the larch, it was thinned out with a free hand to the number of about 550 trees per acre, including decayed ones. Out of this number only 250 trees were of a sufficient size for net stakes, the others being inferior, and fit only for pea sticks or training rods, for which there was no demand in the district.

The Scots pines were thinned out to the number of 400 per acre, none of which were of any use, for though some of them were large enough for net stakes they were too soft for that purpose.

Spruces were thinned out to the number of 400 per acre; 10 out of every 100 were fit for and made into net stakes, but were much inferior to the larch, and sold at one-fourth less money.

Including hardwoods and all sorts, 1500 trees in all per acre were thinned out, leaving the crop upon the ground at 5 to 6 feet apart, being at least twice the number that should have stood upon the ground at the time if they had been properly clothed with branches. Owing to the latter defect they were thinned sparingly.

The work of thinning cost at the rate of 40s. per acre, or 2s. 8d. per 100 trees. This included pruning, collecting, and carrying out useful thinnings only, not the branches or useless weeds; which latter, if cleared out, would have cost a sum at least equal to that of thinning. The money received for net stakes was L.8, 10s., which, after deducting 1s. 8d. per 100 for making, left to the proprietor 14s. 7½d. per acre as clear return from the ten acres thinned; 8s. 4d. per 100 received for the stakes. It may here be stated, that during the performance of the work of thinning the workmen had a distance of from four to five miles to walk night and morning, which made a difference in the amount of labour of fully one-fifth over that of doing the work near their homes.

With regard to management, the state of the plantation is good, except where the Scots pines are too thick; as respects the health and development of the trees it is bad, except the spruces upon the soft ground, which are all that could be wished.

The Scots pines are of two classes, either slender, with few branches, or coarse and badly grown, many of them bent and crooked, being so disposed from others overcrowding them.

The hardwoods are still in a backward condition, having by far too few branches upon them, which will ultimately result either in retarded growth at an early age, or in tall slender trees, unable to bear the elements of wind and storm.

Owing to the suitable quality of the soil, and other circumstance, reasonable hopes might have been entertained of a good and profitable crop of timber from No. 2. This, it is quite apparent, will not be the case. What, then, is the cause or causes of failure? In what does it consist? And what is the preventative or remedy?

The causes of failure are numerous, but the chief one is that of mixing trees together that should always be grown separately, they being uncongenial and antagonistic in their natural habits of growth. The soil being naturally damp, a free current of air and the direct rays of the sun are essential to evaporate the noxious vapours and impart life to the languishing trees. Unfortunately the very reverse of this was the case, the crowded condition of the trees precluding both sun and air.

Thinning in this case should have been performed at five years on the west side of the plantation, and at six years on the opposite side. Part of the latter is composed of a large proportion of Scots pines, standing upon the ground to the number of about 1500 trees per acre. Some of the trees, indeed, though now fourteen years planted, are standing not more than 4 feet apart, 12 to 16 feet in height, with stems not over 8 to 10 inches girth at the ground, thus exhibiting an unfavourable example in thinning to be carefully and timeously avoided. Trees of the above age so situated should not, if properly thinned, be standing closer than 7 feet to 8 feet apart. The cost in thinning at six years planted is about 5s. per acre, whereas *now* it will cost twelve times that sum.

In thinning at five or six years planted, the thinnings are, of course, of little or no value, consequently the labour bestowed is a dead loss of 5s. per acre. In thinning at eight or ten years planted, the thinnings, as in this instance, are worth 14s. 7½d. per acre, but then the cost of labour was 40s. per acre, thus showing that in point of economy the former period is to be preferred, while the advantages resulting to the future crop cannot be over estimated.

The results arising from deficiency of branches on Scots pine is seen at a comparatively early stage of their growth, while the full amount of injury which hardwoods sustain from a similar cause are not fully shown till the trees are from forty to fifty years

planted, at which time it is often unhappily discovered that the trees, instead of being worth shillings or pounds, are found to be worth only pence or shillings.

No. 3 is a so-called fir plantation, also in the county of Roxburgh, planted in 1822, 1823, 1827, composed principally of Scots pine, with a small mixture of larch in a few places, a few spruces in other places, and also a few hardwoods; the latter, however, are so worthless as unworthy of further notice.

The plantation is in form a long narrow belt or strip about 2000 yards in length by a mean width of four chains. No part of the plantation boundary is quite straight, but of agreeable curves, and contains about forty acres. It extends from east to west across a heathy bleak plain or moor, affording on both sides shelter to the stock of two separate farms, between which it constitutes the march. It is situated at an altitude of between 400 and 600 feet, and is freely and openly exposed on all sides, the ground inclining to the north-east, to which one side of the belt is freely exposed, while the opposite side is equally exposed to the south-west, where the wind has blown down the greatest number of trees.

Between the two extremities of the plantation, from east to west, the surface of the ground undulates considerably, though, when viewed from either end, it appears nearly level, except at the west end, which rises in one uniform ascent to the highest part of it. The soil is upon sandstone rock, and varies in depth and quality in accordance with the surface of the ground. The greater part of it is light sandy moorland, with a mixture of sand and gravel in the subsoil. Several slight valleys occur, which are drained, each valley having at least one drain through it, which also serves to convey the water from the pasture ground higher up. In these valleys the soil is deep, cold, and damp, some parts of it being a mixture of clay and sand, and others nearly pure vegetable mould, or clay and moss void of sand; on the latter description of soil all sorts of trees decayed except spruce, which alone here luxuriates on such soil.

The fence is a turf dyke with two rails of paling on top. A whin hedge was also sown, which did pretty well for several years, but ultimately disappointed the hopes entertained respecting it, having withered and died when a severe frost occurred. The trees were originally planted to the number of 4000 per acre, and were once gone over afterwards, making up the blanks, which did not exceed 10 per cent. upon the number originally planted.

The plantation, owing to various circumstances, was thinned at different times; one part of it at twelve years planted, another at fifteen years, another at twenty years, and another at twenty-nine years. That portion thinned at the latter age comprised the

greater part of it, which, with the former portions thinned, included nearly the whole of the plantation, a few spots only remaining to be thinned. A circumstance of the highest importance, and worthy of special attention, was the order and system which had been laid down and adopted in the process of thinning. It has just been stated that at four different periods thinning was performed upon this plantation nearly all of the same age, yet differing at the age of being thinned to over one-half. The principles upon which this system was based, and the results to which it has led, will appear in the sequel.

The instructions were to thin first the most advanced parts upon the best and most sheltered ground, allowing the trees the greatest amount of space, then the next most advanced and favoured parts, and so on in succession, leaving the most exposed parts, and that upon the poorest of the soil, till the last, with the trees closer together upon it.

To a person partially acquainted with the growing of plantations this system may appear to be a right and proper one, but its evil effects need only be pointed out to convince any ordinary mind that it is a false one. To leave the trees closer together upon the poor soil than upon the rich, was to give the former a heavier crop to bear than the latter, while, as is well known, it is less capable of doing so. To leave the trees thicker upon the exposed parts was in effect to put to the front and hottest of the battle the undisciplined raw recruit instead of the tried veteran of many campaigns; because trees, if allowed to grow close together, are just in proportion to their closeness tall and slight, drawn up with comparatively few branches, and such branches small, slender, and weakly. The trees now standing in this plantation may be seen as above described, many of them 25 feet in height, and yet not quite 3 inches diameter at the ground, with branches not quite 3 feet in length. Of all sorts of trees these are least fitted to stand the gale, and least qualified to protect and shelter other trees, or afford shelter for stock, one of the principal objects for which they had been planted.

The proper method of thinning in this case would evidently have been to thin from one end to the other at nearly one time, at the age of eight or nine years, leaving the trees upon the ground at 7 to 8 feet apart. By this means the trees on the exposed parts would have had room to furnish themselves with root and branch, their only defence against the storm and tempest. Of course, they would not be so tall as their more favoured neighbours of the same age; but this is just so far to their advantage, seeing they would be more proportionably grown, having a girth proportioned to their height, and a spread of branches equal to the functions they have to perform.

There is one very prevalent error in the treatment of plantations grown exclusively for shelter, viz., that the trees are allowed to stand so long in a crowded condition as to destroy the vitality of the greater portion of their branches, therefore proving next to no shelter at all, and that little which is afforded is of short duration. The very means employed to accomplish that one object (shelter) are the identical means by which its attainment is frustrated.

The object of planting No. 3 was to beautify the country, to afford shelter to the stock on two separate farms, to form a cover for game, and ultimately to yield a profitable crop of common sized timber, suitable for country purposes and general estate work. The attainment of any one of these objects has not been effected, except that of beautifying the country to a certain extent; and in so far as there is now a plantation where before only a wild, heathy, bleak moor existed, by so much has an improvement been accomplished. The trees, individually, of which this plantation is composed, are more like subjects of art and manufacture, being long bare poles, destitute alike of handsomeness and beauty, as trees, than products of natural growth; it therefore follows, that the whole must be of the same quality as the individual trees are of which it is composed, and which are by no means beautiful. There is another eminent defect in the beautifying part, which, however, is not the result of improper management, but is the result of want of forethought in planting; the defect complained of is the absence of a few groups in certain conspicuous places. There are spots well adapted to grow larch, spruce, sycamore, beech, willow, and poplar, which would have afforded a varied and lively contrast to the dull, dark Scots pine, of which the plantation is chiefly composed. There are, indeed, a few larch and spruce, and one single tree of Huntingdon willow, sprung from a withe which was used in binding a bundle of plants. This withe was stuck into the ground in a damp place. It grew up, and now forms an object pleasing and agreeable to the eye, forming, as it does, an excellent contrast to the grey dark pine.

There are a few larches situated principally at the east end, in the centre, and at the west end; with the exception of the latter, the others are all affected with ground-rot and dry-rot, which if not produced, are at least greatly aggravated by the trees being too much drawn up without due branches upon them. Near the centre is a group of spruce which, at an early age, was duly thinned, and though neglected in this respect afterwards, yet was so far benefited, that a useful crop was thereby secured. In 1860, the ground which these spruces occupied was at least twice the value of any similar area on the plantation; the largest

of the trees was over 40 inches in girth, at 6 feet from the ground, while the average girth of the general crop over the whole plantation is about 12 inches.

Shelter, as stated, was another object sought, but from the manner in which the trees are grown, little shelter is thereby afforded. The wind and storm, in place of being modified and filtered, whistles through the lean defenceless shelter-belt with almost undiminished violence, and, but for the turf-dykes with which the plantation is enclosed, the snow would drift through it with perfect freedom.

Cover for game was also contemplated. As respects surface cover, there has been almost none for many years; with this, as with shelter, the means employed to secure either are the means by which they are destroyed. Live branches below half the height of the trees are rare. Those which decayed were in some places very properly removed from the trees by means of the hand-saw, and carried out of the plantation, and burnt.

The last, but most important of all objects, that of profit, is even a more signal failure. The trees are now over forty years growth, and with due care and attention when young, considering the favourable situation, soil, climate, &c., ought to have been now timber size, in other words, to contain four cubic feet of measureable timber each on an average. Instead of this, the great proportion of the trees are below 3 inches diameter at 12 feet; while a considerable number are not quite 2½ inches diameter at 6 feet from the ground.

A few years ago, a friend of the proprietors well acquainted with woods, asked the forester if this and some others of the plantations of similar age were size enough for railway sleepers. Both parties were much surprised—the gentleman at finding the woods so far behind what he anticipated, and had great reasons to expect; the forester, at what he conceived premature expectation. It soon became pretty generally known that this and other plantations on the estate, nearly forty years planted, were much below what they ought reasonably to have been under the natural advantages they possessed. Little was known beyond this, that thinning was universally recommended, right or wrong. Now, while the want of timeous thinning was the certain cause of the trees being so small, destitute of branches, and ill-proportioned at that age, it by no means followed as a consequence that subsequent thinning was to remedy such an evil. It is difficult to state precisely the age at which thinning ceases to be beneficial to plantations, and when, if continued beyond that age, it becomes injurious. Suffice it to say, that the writer, in his experience in thinning plantations grown exclusively for profit, is unable to point out a single instance in which thinning pine or fir plantations over thirty years planted has proved beneficial, and also

his inability to show a subject thinned, over forty years planted, in which thinning has not had an injurious effect, both in respect to the health of the general crop and also as tending to lower the highest attainable value of the crop.

No separate account having been ever kept of the expenses entailed in thinning this or any one of the plantations upon the estate, a correct statement cannot now be given. In 1848 a considerable portion was thinned, which occupied eight to ten men the greater part of the summer; but being in patches in various places throughout the plantation, no definite statement can be given of the cost per acre, or of the number of trees thinned out.

The thinnings were cleared out of the plantation by men and horses. Narrow roads were cleared, and the thinnings laid in them in heaps,—as many in each as a horse could draw by means of a chain fastened round them. Four to five lots per day were cleared-out of the plantation, containing from one to one and a-half cart loads each. These lots cost in clearing out of the plantation, exclusive of cutting, about 2s. each, and sold by auction at from 1s. to 1s. 6d. each lot; thus not only was there nothing left to the proprietor for the thinnings, but an additional expense incurred against the plantation.

The uses to which the thinnings were applied were either for fuel by the cottagers in the district, or in forming temporary fences upon the farms, such as dividing grass and pasture fields; the tenants upon the estate, however, being supplied by the proprietor with a superior class of fencing wood, found very little use for the former description of wood. Subsequent thinnings were used almost exclusively upon the estate for fencing purposes; within the last twelve years a considerable quantity of paling-wood, posts, &c., were thinned out of it.

The cutting and branching of the trees was done by the proprietor's men, but the tenants carried out of the plantation and carted to the saw-mill the wood used by them. The largest and straightest of the trees were used for rails, and the shorter and inferior class for posts of various sizes.

The stakes, 3 to 4 inches in diameter at small end, were sold at about 1d. per lineal foot, and the rails, $4 \times 1\frac{1}{2}$, at about one farthing per lineal foot. These prices include carting, sawing, stacking, &c., which, when all expenses are deducted, there is left to the proprietor about one farthing per lineal foot for the wood growing in the plantation.

One farthing per lineal foot is what the proprietor obtains for his wood of this size and description, when disposed of to the tenants upon the estate for fencing. The following statement in detail will show this more fully :—

60 trees marked by forester, including some useless ones, . . .	= £0	0	6
„ cut by two men in one day, @ 2s. 4d. per day, . . .	= 0	4	8
„ man and horse, carting distance 1 mile, 1 day	= 0	7	0
„ clearing out branches and assisting to load cart, . . .	0	2	4
Sawing 40 roods of paling out of the 60 trees, at 3¼d. per rood (3 rails), .	= 0	10	10
	£1	5	4
40 roods paling, sold at saw-mill at 1s. per rood,	= £2	0	0

The proprietor has, therefore, 14s. 8d. for the wood, which produces 40s. worth of sawn paling. 720 lineal feet of rough wood are required to produce the above quantity, which, at one farthing per foot, amounts to 15s. It will be observed that the trees were only size enough for paling rails to an average length of about 12 feet, thus requiring 60 trees to make 40 roods of paling.

A small quantity of the thinnings were converted into pit-props, for which the proprietor derived still smaller returns, after carting to railway a distance of 5 miles, thence carriage on railway about 50 miles, there remained to the proprietor only about one-eighth of a-penny.

Squirrels commenced their ravages upon the Scots pine when about fifteen years planted, by stripping off the bark in order to reach the saccharine matter, of which they are very fond. About twelve years ago one-half of the number of trees upon the ground were less or more injured by them, a great part of which were entirely destroyed; since that time a considerable number of the damaged trees have been thinned out, and at present only about 20 per cent. of the whole standing crop is injured.

In 1859 arrangements were made for their suppression, if not extirpation, prior to which date nothing of any importance was done to prevent their destroying the trees. The arrangements and operations were simple, but truly effective. The keepers in each district of the estate were to kill them and preserve the tails till stated periods of six months, when, on bringing them to the district forester, received 3s. per doz. This was the premium fixed for the first year: 6d. per tail was named for the second; 1s. for the third; and so on to 5s. per tail. The same plan has been adopted upon other estates, and works well. If the same system were practised generally over all Scotland, squirrels would soon be all but extirpated.

In addition to the injurious effects of the squirrels, other un-

favourable aspects of the plantation are the badly rooted condition of the trees individually, and the disproportional growth—many trees being nearly 50 feet in height and only 30 inches in girth near the ground, with trunks from 30 to 40 feet in height without any live branches being upon them; others 40 feet high, girth near the ground 24 inches; others 30 feet high, girth 15 inches near the ground; others 16 feet high, 7 inches in girth. The distances of the trees apart vary from 3 feet to nearly 20 feet; but the average distance apart of the whole trees is about 9½ feet=500 trees per acre, averaging 18 lineal feet each=9000 feet, at one farthing per foot=L.9, 7s. 6d. per acre, the sum which the proprietor would derive by selling it at the present time for paling purposes; but if sold for prop-wood only about two-thirds of the above sum would be realised by the proprietor.

The following is the prospective highest attainable value at 60 years' growth, assuming that nothing further is done to the plantation beyond cutting out each second year the decayed and wind-fallen trees. At that age the plantation may be expected to be at its highest state of perfection. The following is the value it may then be expected to attain, allowing for decayed and wind-fallen trees during its growth 100 trees, being about 6 trees per acre per annum :—

30 timber trees containing 7 feet each=210 feet, at 8d. per foot, ...	£7	0	0
260 sparwood trees, from 5 to 8 inches diameter at 12 feet, at 1s. 6d. each, . .	19	10	0
110 pit-prop trees, 3½ to 5 inches at 12 feet from the ground, at 4d. each, . .	1	16	8
Estimated prospective value per acre,	£28	6	8

The value of the ground occupied by this plantation is 7s. 6d. per acre, which in 60 years amounts to	£22	10	0
Planting, draining, and enclosing, per acre, .	5	0	0
	£27	10	0

From the above statements, as they stand, it appears that planting is more remunerative than grazing; but if we add to the principal simple interest, or, which is more proper, compound interest, the balance would be vastly in favour of renting the ground for grazing. It must be inferred that planting, in order to pay the proprietor, must be done in the first instance at moderate expense combined with efficiency, the ground and trees thereon planted must be adapted to each other, and the management throughout must be judicious and skilful.

In the foregoing calculations the value of the general thinnings

are not taken into account, being allowed to meet the general expenses.

Any piece of ground taken off for planting has, from the time it is enclosed, a rent valuation continually accumulating against it with interest. In many plantations there is good pasturage for sheep or small cattle during the summer months, hence it is often advisable to lay such plantations open for grazing, if not otherwise kept as game preserves, and which, if kept for the latter purpose, a rent against the game ought to be charged to the amount the ground is worth for pasturage, by this means getting quit of what would otherwise very much swell up the chargeable amount unnecessarily. This is precisely the case in the plantation described, wherein sheep, for several years past, could have done no possible injury to the trees.

The writer has never seen sheep produce any injurious effects upon pine or fir plantations over fifteen years planted, by grazing amongst them in the summer time, nor even during winter, except in snow and frost, when pinched with hunger. Under the latter circumstances, when the tops of the trees and green branches are within reach of the sheep, they do bruise them, though they scarcely ever eat them. Sheep accustomed to graze in the pine forests of Strathspey scarcely at all injure the plants, while sheep unaccustomed to them do at first partially injure them.

Goats also, though fond of the moss and lichen which grows upon the bark of the trees, do not appear to injure the plants. On examination of the trees, where hundreds of goats are grazing, there is no appearance in any instance of the bark being broken or of the top shoots being bruised or eaten. In the writer's experience, where the soil is rich and the grasses rank and luxuriant, it is beneficial to plantations to pasture them during summer as soon as the branches of hardwoods are above the animals' reach, and the leading shoots of pine and firs out of the way of injury; but on poor dry ground, with little herbage, grazing seems of little or no advantage to the growing trees, but in some cases the reverse. The apparent advantages which trees seem to derive from having the luxuriant grasses kept down by sheep or otherwise during the summer months are, modification or prevention of ulcer in larch, and diminution of insects which infest the trunks and branches of trees, as the *Coccus laricis*.

No. 4 is a larch plantation in the county of Sussex, in the south of England, thirty years planted. The trees were irregularly dispersed over the ground, having been so left after clearing a crop of hop-poles at time of cutting. The best of the larch trees were marked with a streak of red paint previous to the lot being sold. The trees thus marked were termed *tellers*, and now constitute the subjects of the present statement. The trees,

from the time they were relieved of the surrounding crop, had all of them ample room, some of them, as trees grown for profit, superabundance, but grew with an amazing degree of rapidity. Many of them were clothed with branches to within 6 feet of the ground, and the tops of the branches resting upon it, each tree on an average covering an area of about 300 feet. The annual growths or rings which indicate the growth of the trees were in some cases from $\frac{5}{8}$ths to $\frac{7}{8}$ths of an inch thick, showing that the trees were making from 2 to 3 cubic feet of timber annually. Some of the largest trees girthed from 7 feet to 8 feet at 3 feet above ground, and contained as much as 32 feet to 36 cubit feet each. The average content of the whole trees was 20 cubic feet. When the trees were cut down, the largest ones, with the greatest quantity of branches, were found to be quite sound and of vigorous growth; while the smallest ones, which had their side branches destroyed to 10 or 12 feet in height before being relieved of the hop-pole crop, contained only from 12 to 15 cubic feet, and were found, on being cut down, to be considerably decayed in the heart-wood, the evident result of deficiency of branches.

The soil upon which those trees grew was a sandy loam, from 10 to 12 inches deep, resting upon white, dry, and open sandstone subsoil; altitude about 300 feet above the sea; exposure, north-east; sheltered from all other points by a belt of Scots pine, 50 to 100 yards broad; the trees 50 to 70 feet high.

No 5. The management of natural forests coincides in many respects with the management of planted woods, but in some particulars it differs. Natural woods, from the circumstance of being self-propagated, originating in the seed being conveyed from the parent tree by various means (principally the wind) at various periods, consequently spring up in an irregular manner, both in respect to age and distribution of the trees over the ground .The trees in the natural forest being, therefore, less regular in size than in plantations, generally require the thinning to be performed by cutting the largest and the smallest classes of trees, thus leaving the medium class to constitute the permanent crop. The time most proper for thinning natural forests cannot well be specified, and owing to the slowness of growth in some cases, and rapidity in others, no definite age can be fixed. The distance apart at which the crop springs up influence in an important degree the period at which thinning is required.

The writer, during the last four years, having practised thinning pretty extensively, has had the advantage of witnessing its effects upon portions of forest of all ages and size. The following is the system and results of observation :—

To thin in all cases before the side branches touch each other. In some cases this is required to be done before the trees are

3 feet high. In all cases, before the trees which constitute the crop, after being thinned, exceed 8 feet in height, as a rule, we thin to a general distance of 7 to 8 feet apart, or, in other words, reduce the crop to about 700 trees per acre when they are from 7 to 8 feet high. This system of thinning possesses several advantages, amongst which are, no injurious consequences having resulted to the trees previous to being thinned. The work of thinning is performed at a time when it can be done to greatest advantage in point of selecting the standard trees, and of doing the work at least expense, seldom exceeding 5s. per acre; also that the thinnings, on being cut and laid flat on the ground, in a very short time rot out of sight, hence the general untidiness often observable in young woods is prevented, and the evil consequences believed to result from noxious gases generated by decomposing wood are also obviated.

First, Thinning of pine and fir plantations and forests, to be done so as to confer the greatest amount of benefit to the permanent crop, should be performed not when, but before the side branches touch each other.

Second, Thinning should not be deferred till the lower branches begin to decay, but should be performed in order to prevent the possibility of such occurring within the period of thinning operations.

Third, The future object in view with the plantation must in all cases determine the extent to which thinning should be done. For example, a larch plantation grown with the object of being cut down for fencing purposes and general estate repairs, at thirty to thirty-five years planted, would not require to be thinned at any time to over 6 feet apart; whereas the same plantation, if intended to stand till sixty years, and at that date to supply sleepers, planking, and large scantling, would require to be thinned out to a general distance of 20 feet.

Fourth, In thinning a shelter belt, the lowest ground on the exposed side should be done first, and next in succession the high ground on the same side. The high ground and most exposed parts, though longer in being ready to thin, should, when sufficiently advanced, be thinned to the same distance apart as those upon the good ground were when of equal size. In thinning the girth of the trees ought always to be considered and attended to as well as the height.

Fifth, As a rule in thinning, with a view to produce good sized timber trees, the height of the tree in feet ought to correspond with its girth in inches about 2 to 3 feet above ground. Trees grown of these proportions will appear about the period when thinning should be discontinued as if too much taper were upon them. The circumstance, however, must here be borne in mind, that as soon as thinning ceases the trees soon close together.

The lower branches are first checked, which in turn diminishes the enlargement in the lower part of the tree, while the upper part is rapidly expanding itself. Hence, in about twenty years such trees will girth nearly as much at the middle as they do near to the root. Another, and not the least, advantage of this system is that trees thus treated remain healthy, and grow rapidly at an age beyond that at which, under other treatment, they languish and decay.

Sixth, Thinning pine and fir plantations which have been neglected till two-thirds of the height of the trees have been deprived of vital branches, with a view to improve and enhance the value of the permanent crop, appears a fruitless work. As it is very evident that thinning in such cases does not promote the growth of the remaining crop, but the reverse, yet, under good forestry, such plantations may be improved in other respects by removing small worthless trees, which exclude sun and air from the plantation ;* also by thinning out worthless rubbish (not in a growing condition) herbage is thereby encouraged to grow, which may be turned to advantage for grazing, and a neatness and uniformity is thereby imparted to the plantation.

Seventh, In thinning hardwood plantations which have previously stood so close together as to injure the side branches, great attention should be paid to the soil and exposure before commencing to thin. An instance illustrative of this came under the writer's observation a few years ago in the county of Sussex (famed for its oak). The oaks of which the plantation was composed stood unthinned till fourteen years' growth, at which age the trees stood about 4 feet apart. Thinning was performed, and the trees left upon the ground 8 to 9 feet apart. At the time the writer saw it he concluded, from the size of the trees, that the plantation was from fifteen to eighteen years planted; but the appearance of the trees in other respects were indicative of greater age. In order to satisfy himself, he cut one of the trees down, and on counting the rings he found the age thirty-three years. The annual growths indicated by the rings showed the tree to have made as much wood in one year previous to thinning as it did during eight years afterwards. A small portion of the same plantation, left for some reason unthinned, was in a state of rapid growth ; but, of course, the trees were tall, slender, and unlikely to attain valuable dimensions. The situation was exposed, facing the south-west, and the soil a stiff cold clay, resting upon sandstone rock.

The best season of the year for examining or marking a hardwood plantation is in September. At that season trees that are

* In some cases it is as absolutely necessary to preserve shade and moisture to pine plantations as it is in others to admit air and light, all depending upon the nature of the soil and age of the trees.

sickly show it in the foliage, which is easier observed than at any other period of the year.

The state of health of pine and fir plantations is most easily observed in June. At that season trees far gone with decay become brown, while those becoming sickly show it in their leaves being shorter and of a clotted appearance.

REPORT ON THE AGRICULTURE OF DUMFRIESSHIRE.

By the Rev. John Gillespie, A.M., Mouswald Manse, Dumfries.

[*Premium—Thirty Sovereigns.*]

Introductory Remarks—General Description of the County.

The large and important county of Dumfries is pleasantly situated on the north shore of the Solway Frith. It is bounded on the north by the counties of Lanark, Peebles, and Selkirk; on the east, by part of Roxburgh and Cumberland; on the south, by the Solway Frith; and on the west, by the stewartry of Kirkcudbright and the county of Ayr. In form, it is irregularly ellipsoidal, the greater diameter extending from the mountain of Corsoncone, in the county of Ayr, to Liddel Mount, in the county of Roxburgh, runs in a south-easterly direction, and measures about fifty miles; and the lesser diameter, from Loch Craig, in the confines of Peeblesshire, to the mouth of the Nith, near the Castle of Caerlaverock, extends in a direction west of south, and measures about thirty-two miles. Its ellipsoidal form is not only irregular in every part of the circumference, but in three parts it is much indented by the bounding lines of other districts and counties. These indentations are formed by the southern point of Lanarkshire extending to ten miles, by Ettrick Head (five miles) in Selkirkshire, and by the parish of Terregles (three miles) which lies at the exterior angle formed by the rivers Nith and Clouden, which are the boundaries of the county in that quarter. In latitude it extends from 55° 2′ to 55° 31′, and in longitude from 2° 39′ to 3° 53′ west from London.

The county is divided into three dales or basins, which take their names from the three streams by which they are drained—the Nith, the Annan, and the Esk. The valleys of Nithsdale, Annandale, and Eskdale are almost parallel, and are separated from each other by ridges of various elevations. Annandale, which is in the centre, contains twenty-one parishes, and the valuation of it in 1866–7 amounted to L.181,018, 13s. 1d. Nithsdale, on the west of the county, has seventeen parishes, and its valued rental in 1866–7 was L.162,285, 12s. 1d. Eskdale, which

is the eastern division, contains only five parishes, and was valued in 1866–7 at L.46,256, 19s. 9d. The whole extent of the county is 1129 square miles, or 722,813 statute acres, and its valued rental at the present time is L.389,561, 4s. 11d. The estates of the different proprietors are very various in extent and value. The Duke of Buccleuch owns more than one-fifth of the valued rental of the county. There is one estate over L.20,000, one L.12,000, one L.10,000, four from L.6000 to L.10,000, twelve from L.3000 to L.6000, twenty-five from L.1000 to L.3000. More than three-fourths of the above proprietors are resident in the county, at least during the greater part of the year.

All the northern part of every one of the three dales is very mountainous, but Eskdale has a much greater proportion of hill pasture in comparison to its arable land than either of the other two. Along the northern boundary there are several summits ranging from fully 3000 to about 2000 feet above sea level. Almost all the mountains, whether on the boundary or in the interior, have an inconsiderable basis, a rapid acclivity, and summits in some instances round-backed or flattened, in others conical, and in a few tabular or flat. The area of the hill pastures (strictly so-called) is 498,364 acres. There are large tracts of permanent pasture at an intermediate altitude between the hills and the arable land. It is impossible to arrive at a correct estimate of the exact extent of this class of land, because, while there are 72,550 acres returned as permanent pasture not broken up in rotation, a considerable portion of it is situated in the lower districts of the county. 132,039 acres were under rotation in 1866. Only a very small portion of this is in the eastern division—the parish of Canonbie and a stripe of the southern part of Langholm being the only portion of Eskdale which is under cultivation. There are indeed patches here and there under crops in all the other three parishes, but these parishes are almost entirely hilly and mountainous. The cultivated part of Nithsdale is about twenty-five miles in length, and its breadth varies at different points. The arable part of Annandale extends from Moffat to Annan, a distance of about twenty-six miles; and while at the head the dale is very narrow, it extends at the bottom to a breadth of fifteen or sixteen miles.

The lower portion of the county, comprising lower Annandale and the most southerly parish of Eskdale, is comparatively low and flat, and is only occasionally marked by low hills. Ten miles of the lower portion of Nithsdale is in all respects a plain, with the exception of a short range of low hills in the parish of Dumfries, and the Mouswald and Torthorwald "heights," which divide the plain from the basin of the Annan. Annandale has within its bounds several minor dales, which are formed by the Milk, Dryfe, Wamphray, Moffat, and Kinnel waters. The

greater part of the county, from its undulating character, is very diversified in scenery, exhibiting an attractive blending of hill and dale. Many parts of it are well wooded, and the plantations have generally been placed to please the eye as well as to afford shelter and serve other purposes. This is true in an eminent degree of the parish of Johnstone, which is on the property of Mr Hope Johnstone of Annandale, and of the district surrounding Drumlanrig Castle, one of the seats of the Duke of Buccleuch. The largest portion of waste land in the county is Lochar Moss, which is situated to the south-east of the town of Dumfries, and extends to several thousand acres. Small parts of it on the outskirts have been reclaimed; but it is so flat and difficult to make dry, that we fear it will remain unproductive for many years to come. The rock at the mouth of the Lochar has been cut, and the proprietors along its course are uniting in an attempt to deepen the bed of the stream.

Section I.—*Soil and Climate.*

1. *Soil.*—Although there is much diversity in the soil of Dumfriesshire, yet it may truly be said of the lower parts of the county that the soil is generally light and kindly, being mostly underlaid with rock, gravel, or sand. About one-half of the arable land of the county is naturally dry, and does not require drainage, some of it being upon freestone, some on whinstone, and still more upon gravel. Large parts of Nithsdale and upper Annandale are composed of dry soil, while in the other districts there are large tracts of land which required drainage, some of it being of a black mossy surface, and part of the remainder thin clay.

It will thus be seen that *gravel* and *sand* prevail much in the soils of this county. Most of the ridges and knolls in the larger dales and lateral vales consist of gravel. *Muir* soils are also very extensive, and are in various stages of cultivation. This whitestone land is well known in this county as a soil naturally barren, though much improvement has been wrought upon it generally. Considerable tracts of valuable *loam* soil are found in Dumfriesshire, and spots of it are interspersed among other soils on the low and gentle slopes of the hills. *Alluvial* soil abounds along the margins of the rivers and streams. It is called *holm* land, and varies greatly in respect of depth and richness. *Peat moss* exists in great fields both in the hills and vales. In many instances it has been drained and converted into soil. When *clay* is found as a soil it is commonly not deep, and is such as in other counties would be called *thin* clay. It exists, however, pretty extensively as a subsoil.

It is difficult to arrive at an estimate of the average agri-

cultural value of the soils of Dumfriesshire. As remarked in a subsequent part of this paper, the soil on different parts of the same farm often varies very much both in its nature and value. A large number of farms are rented at from L.1 to L.1, 10s. per acre; but many are let at lower rates, and many at higher.

2. *Climate.*—In treating of the agriculture of any county or district, the thing next in importance to the nature of the soil is the character of the climate. Virgil, in the first book of his Georgics, remarks, that "before we cut an unknown plain with the coulter we should be careful to learn previously, not only the genius and habits of the soil, but also the winds and the various quality of the climate." This is specially important in describing the agriculture of Dumfriesshire, because it not only, as a whole, differs materially from other parts of Scotland, but there is also considerable variety in this respect between the different parts of itself.

The exposure of Dumfriesshire is generally good. The greater part of the three dales of which it is composed have a southern exposure, and thus lie full to the meridian sun. It lies on the Solway Frith, and therefore a considerable portion of it is low and warm. It is protected from the north and east winds by the high mountainous ranges which encircle it on the north and east. Most of the rain which falls in the county is accompanied by mild winds from the south and west. Hence these are very different from the bitter piercing winds which are felt all along the east coast. But, though the rainfall is in general mild, it is at the same time very plentiful. From the vast Atlantic heavier and more extensive clouds are borne on the wind, and discharge themselves over the western coast, than the German Ocean emits on the east. Tables will be subjoined from which may be ascertained the comparative rainfall in this county and in several other parts of Scotland, including the east coast. It will be observed that, whereas the average rainfall in middle and upper Nithsdale was 33·82 inches, of middle and upper Annandale 34·56 inches, and of Eskdale 38·51 inches in 1855, the total rainfall during the same year at Auchterarder House, Strathearn, Perthshire, was only 19·20 inches, and at Inveresk, Musselburgh, Mid-Lothian, 21·43 inches. The comparatively small rainfall in these districts accounts for the vast superiority in the quality of the grain which they produce compared with the grain grown in such a moist climate as Dumfriesshire.

But though the climate as a whole is so very moist, yet there is a considerable variety in this respect between the different districts into which the county is by natural characteristics divided. This, which was for many years matter of conjecture, has at length been established beyond dispute. In the beginning of 1854, Mr Charles Stewart instituted a system of meteor-

ological observations, which were confined for that year to middle and upper Annandale. His observers were the schoolmasters of the district; and Mr Stewart having provided them with the necessary instruments, they entered most heartily into the project. The success of the scheme was so marked and satisfactory, and the information which it elicited so interesting and useful, that the Duke of Buccleuch purchased additional instruments, to enable the observations to be extended to middle and upper Nithsdale, and also to Eskdale. This was done in 1855, and the results were published in due course. We subjoin an abstract of the report for that year, simply premising that the rainfall in all parts of Scotland was unusually small in 1855, being one-fourth below that of the previous year, and considerably under an average. From these tables the reader will also observe the heights above sea level of the various localities, where the observations were made. We also specify the rainfall at the various stations from 1st May to 1st November, that being the most important season for the grain crops.

Weather Table of Districts in Dumfriesshire for the Year 1855.

Middle and Upper Nithsdale.

Height above Sea Level.	Places of Observation.	Aggregate of Rain for whole Year.	Rainfall from 1st May to 1st Nov.	Therm. mean of Max. and Min.
244 feet	Morton, Thornhill,	32·30	20·90	44·88
459 ,,	Durrisdeer School,	27·60	15·10	...
206 ,,	Closeburn, Wallacehall,	23·10	14·40	...
195 ,,	Penpont Manse,	30·80	20·20	...
155 ,,	Keir Manse,	33·25	20·85	45·59
629 ,,	Tynron, Auchenbrack,	37·97	23·30	44·72
354 ,,	Glencairn, Hastings Hall,	43·75	25·70	43·82
534 ,,	Kirkconnel School,	29·30	19·10	...
499 ,,	Sanquhar, Crichton School,	32·50	19·50	...
1564 ,,	do. Wanlockhead,	47·65	30·65	...
	Average,	33·82	20·97	

Middle and Upper Annandale.

Height above Sea Level.	Places of Observation.	Aggregate of Rain for whole Year.	Rainfall from 1st May to 1st Nov.	Therm. mean of Max. and Min.
680 feet	Hutton, Corrie School,	39·10	26·20	41·10
549 ,,	Moffat, Evan Water School,	37·47	25·85	41·15
374 ,,	Johnston, Good Hope School,	39·40	26·20	40·98
348 ,,	Moffat, Town,	35·60	24·80	...
338 ,,	Kirkpatrick-Juxta School,	35·52	23·67	44·18
317 ,,	Wamphray School,	31·97	21·67	42·18
296 ,,	Dryfesdale, Lockerbie School,	31·45	20·35	45·26
239 ,,	Kirkmichael School,	32·34	21·10	...
224 ,,	Applegarth, Sandyholm,	28·65	18·50	42·12
171 ,,	Lochmaben School,	34·13	19·73	43·05
	Average,	34·56	22·80	

Eskdale.

Places of Observation.	Aggregate of Rainfall for whole Year.	Rainfall from 1st May to 1st Nov.
Langholm School,	38·50	26·00
Westerkirk do.	35·95	21·65
Eskdalemuir do.	44·70	29·90
Ewes do.	43·90	26·70
Canonbie do.	29·50	20·10
Average,	38·51	24·87

The following table exhibits the comparison between the rainfall in the three districts of the county and that in other districts and localities for the whole of the same year, and also from 1st May to 1st November. Subsequent observations have shown that the relative rainfall in these districts in 1855 was similar to what it is in the average of seasons :—

Names of Places.	Rain Gauge 1855.	
	Whole Year.	From 1st May to 1st Nov.
Middle and Upper Nithsdale,	33·82	20·97
Middle and Upper Annandale,	34·56	22·80
Middle and Upper Eskdale,	38·51	24·87
Dumfries, Town,	26·25	16·85
Do. Mean Temperature, 45·60.	...	...
Hardgrave, Dalton, Lower Annandale,	26·13	16·68
Carlesgill, Wester Kirk, Eskdale,	42·10	27·50
Lanrick Castle, West Perthshire, Perthshire,	34·22	23·47
Auchterarder House, Strathearn, do.	19·20	13·04
Bridge of Earn, do. do.	20·92	14·68
Inveresk, Musselburgh, Mid-Lothian,	21·43	14·16
do. Mean Temperature, 45·50.	...	...

SECTION II.—*Causes which have contributed to the Advancement of Agriculture in Dumfriesshire.*

The advancement which the agriculture of Dumfriesshire has made during the present century has been very marked. The extent of this improvement may in some degree be inferred from the respective valuations of the county at the close of the last century and at the present time. The real rents of land in this county, as computed betwixt the years 1790 and 1800 (assumed as corresponding to 1795), were estimated at L.109,700. The annual value of real property had risen in 1815 to L.295,621; but the intelligent reader will not require to be told that this large increase was owing only in a very small degree to any improvement which had been wrought in the condition of the land, but was almost entirely occasioned by the extremely high prices which agricultural produce commanded during the time of the war. A few years after the close of the war, landlords had to give a very large reduction of the rents of their farms, so that about 1820 the real rental would not be more than, if indeed as much as, one-half of what it was in 1815. The valuation of the county in 1866–67 was L.389,561, being L.279,861 of an increase since 1795, or fully three and a-half times as much as at that period. This is exclusive of the valuations of the four parliamentary burghs, and of L.117,500 for the railways which run through the county. But at no period has the advancement made been so great and striking as during the twenty-five years over which this report extends. The very great increase in the valuation now is principally owing to the improvements which have been wrought on the land; and it ought not to be overlooked that Dumfriesshire being strictly an agricultural county, the rise in value must be traced almost entirely to the greater productiveness of the soil. It is different in this respect from Ayrshire, Lanarkshire, and other mining counties, for they are largely indebted to their minerals for their increased wealth. To illustrate this increase further, the Reporter appends a statement of the rental on a particular property, and also of a single farm at various periods. The rental of the property in question had risen in 1815 (in consequence of the war) to L.20,000. In 1830 it had fallen to L.14,000. It is now L.22,000, and if let at the rates which have been current during the last seven years, it would yield a good deal more. The farm referred to was rented in 1792 at L.65. In 1815 it was L.280; in 1823 it was reduced to L.140, and it is now L.230. In both instances, as in the case of the county generally, this very large increase is principally owing to the extensive and varied improvements which have been carried out.

Very many causes have contributed to that advancement, the chief of which we shall now proceed to enumerate and illustrate. It will be understood that in doing so we confine our attention to such causes as are peculiar to Dumfriesshire. There are many circumstances of a general nature which have tended to promote agricultural improvement over the whole kingdom; such, for example, as a more perfect and more general acquaintance with the principles of agricultural chemistry, and the marked improvements which have been effected in implements of husbandry. The influence of these has been felt very much alike in all districts and localities, and therefore it would be out of place to burden such a paper as the present with an account of them. There must always, however, be many causes of a local nature which have exerted a powerful influence in promoting the advancement of agriculture in any district or county, and our object under this section is briefly to specify and illustrate the principal of such causes as have been in operation in this county.

1. And prominent among these, because perhaps on the whole the most influential, ought to be mentioned the results which followed the application of steam power, as experienced first in the sailing of a steamboat between Annan and Liverpool, and afterwards more especially in the opening up of every part of the county by railways. Before steamboats and railways were available for carrying away the produce of the land Dumfries, as a county, was extremely isolated. Every part of it was situated at a considerable distance from any of the great centres of population, where all kinds of farm produce would readily meet with a good market. Lockerbie, which is geographically about the centre of the county, is 75 miles from Edinburgh, 80 miles from Glasgow, 90 miles from Newcastle, and 155 miles from Liverpool. These distances will give the reader some idea of the difficulties in the way of conveying the produce to places where it could be consumed, and he will understand how they could not but retard agricultural improvement. It is true, before the time of which we speak sailing vessels came into the ports of Annan and Dumfries, but these ports were both situated at the extreme end of the county, and besides, they were, especially in such a thing as live stock, a very slow and unsatisfactory mode of transit. In fact, live stock were not taken in them at all. The disadvantages under which the Dumfriesshire farmer laboured, from the isolated situation of the county, may be understood from the fact which is recorded by Rev. Dr Singer, and to which further allusion will be made in a subsequent part of this paper, that in 1812, potatoes, for the growth of which the soil of the county was unusually well adapted, could not be sold for more than half the price which they realised in Edinburgh, and

that 1s. 3d. per cwt. was an average price for that commodity. It is true of all departments of industry, commercial and manufacturing, as well as agricultural, that a keen demand for any article has always a tendency to encourage its supply, and that, on the contrary, the supply is meagre if the demand be flat. Thus the difficulty which the farmer experienced in meeting with a ready and favourable market for his produce naturally operated as a check rather than as a stimulus to improvement.

The running of a steam-vessel between Annan and Liverpool first opened up a good outlet for the surplus produce of the county, and thereby gave a considerable stimulus to agricultural improvement. This boat was started in 1821 ; but it was a very tiny craft, and was capable of carrying only a very limited cargo. In 1825, however, a larger vessel was put upon the station, and a great deal of farm produce of all descriptions was conveyed by it to Liverpool, where much higher prices could be realised than had hitherto been commanded at home. In 1835 a similar vessel was put upon the Dumfries and Liverpool stations, and was also largely patronised. Advantageous as this system was for the transmission to a good market of all kinds of farm produce, its advantage was specially felt in regard to live stock fit for the fat market. Before these steamers were started comparatively few cattle were fed within the county. Turnips were cultivated to a very limited extent, and the stock grazed upon the parks were despatched to the south before they were fit to be killed. Only as many were fed as would supply the local demand, and they were mostly exposed for sale on the sands of Dumfries, and were used for home consumption. But the increased facilities for the transmission of stock to such a favourable market as Liverpool, which the steamers afforded, encouraged the feeding of both sheep and cattle, and this in process of time began to be carried on to a considerable extent. About 1830, the late Mr John Pagan, who was well and favourably known to the farmers of Dumfriesshire, commenced business as a cattle salesman in Liverpool, and the satisfaction which he and others engaged in the same trade gave in selling stock on commission acted as a further encouragement to the preparing of cattle and sheep for the fat market. This state of matters was continued until, in 1846, the Caledonian Railway traversed the county through its entire length, and opened up a still more speedy and cheap mode of transit. Farm produce of all kinds, even of such a perishable nature as milk, could be forwarded to a good market on moderate terms. Prices, in consequence, became equalised over the different parts of the kingdom, and the Dumfriesshire farmer, who, from his isolated situation, had at one time been placed at such a disadvantage, was now enabled to compete with the producer who was in

the most central and populous locality. The stimulus which these facilities gave to improvement cannot but be obvious to even the most cursory observer.

Another advantage which resulted from the opening up of all parts of the county by railways (which has been amply done by the Caledonian, Glasgow and South-Western, and North British systems), was the bringing into the county, and the conveying throughout it, of artificial manures and lime. The farmers in the inland districts had to cart these articles such very long distances that sometimes the expense of doing so, as in the article of lime, was so great as to exceed the original cost of the lime itself; hence they were applied more sparingly than they would have been if they could have been more readily obtained. Guano, bones, and other artificial manures, were imported to Annan and Dumfries; but these places, as well as Kelhead, Closeburn, and other lime-kilns, were situated at long distances from the higher districts, for which lime at least was best adapted, and to which it has recently been most extensively applied; hence the farmers in the upper parts of all the three dales of which the county is composed could only improve their land by incurring an unusually great expense, which they were naturally slow to do, simply because it might not prove remunerative. When the railways were opened, all these articles were conveyed to the different stations at a much cheaper rate than the cartage of them would have cost, and therefore they are at the present time tenfold more used than formerly. Lime can be laid down in many parts of the county at about one-half what it cost previous to the introduction of railways; while in other remote parts, such as Beattock, it costs only one-third of what it did at that period.

2. A second cause which contributed largely to the rapid advancement which agriculture has made in Dumfriesshire within the memory of living men, is the introduction and gradually extended use of bones, guano, and other artificial manures. Until 1822, no other, except farm-yard manure, was in use in the county, for the cultivated land. In that year, Mr Hepburn entered upon a lease of the farm of Cumrue, in the parish of Kirkmichael; and we believe he was the first in the district to use bones as a manure, at least to any extent. His farming was, in consequence, very conspicuous, and attracted much attention throughout the county. His example was gradually followed by some of the more enterprising farmers of the county, until a belief in the beneficial effects of bones as a manure was pretty widely established. By-and-by guano came gradually into use, and rose so high in the favour of many, that some expected it to supersede bones altogether; but it was soon found out that it partook of the nature of a forcing manure, and imparted little or no permanent richness to the soil; hence it came to be used along

with bones, sometimes in a raw state, and often in a manufactured form.

But highly beneficial to the soil as these and other artificial manures were, and great as was the stimulus which their application gave to agricultural improvement in the county, they proved all the more so from the fact that turnip cultivation became necessarily so important a part of the arable farmer's work. Dumfriesshire was, previous to the potato failure, unusually well adapted for the growth of that root, and large quantities of them were grown; but after the failure, it became as ill adapted for their growth as previously it had been suitable; hence the attention of the arable farmer was earnestly turned to turnip husbandry, which had not hitherto been much practised, and was imperfectly understood. Experience showed that the farm-yard manure, when applied by itself, was not sufficient to produce a full crop of turnips. It was found that some forcing manure, like guano, was necessary to bring away the plants at the earlier stages of their growth, and that that farm-yard manure, supplemented by bones, was required to sustain them throughout the later stages. The application of these artificial manures not only enables the farmer to raise a more weighty, and therefore more valuable, green crop, but it further, both directly and indirectly, improves the condition of the land—directly, by the additional strength which it imparts to it; and indirectly, by the large proportion of turnips which are in the habit of being consumed upon the land by sheep. There is no better method of leading any one to understand how much Dumfriesshire as a county owes its agricultural prosperity of late years to the use of artificial manures, than by asking him to conceive an embargo put upon the use of such manures. Why, such a result would place the county in a much worse position than it occupied during the first quarter of the present century; for the arable farmer would not have the potato crop to fall back upon, as was then so largely the case; and experience has shown that unless the farm-yard manure is supplemented by artificial manures, turnips cannot be cultivated so as to be remunerative in any great degree.

3. Drainage is an indispensable condition to the agricultural improvement of such a county as Dumfriesshire. It has been carried out to a large extent, though much yet remains to be done. It may be said generally, that about one-half of the land in the county which required draining has been drained, and that the other half has yet to be overtaken. Fully L.71,000 of the Government Drainage money was expended in Dumfriesshire, for which, as our readers are doubtless aware, interest has to be paid at the rate of 6½ per cent. for the period of twenty-two years. The expense of the remainder has been

defrayed in the first place by the proprietor, but it is customary for the tenant to pay interest on such money as has been expended on drainage during the currency of his present lease.

4. In accounting for the rapid advancement which the agriculture of Dumfriesshire has made during the last twenty-five years, we would specify, as another source of that improvement, the fact that the landlords are generally liberal and enlightened, and the great body of the tenant farmers intelligent and enterprising. It will be unnecessary to remark that a landlord may do much, both directly and indirectly, to advance or retard agricultural improvement. If, for example, a proprietor is in the habit of offering his farms in the market at the end of every lease, and if, giving no preference to the present tenant, he accepts the offer of the highest bidder, in such a case the tenant is not to blame if he takes as much as he can out of his farm before the lease expires. The consciousness that his landlord will show him no favour, naturally leads him not only to make no improvements during the currency of the concluding part of his lease, but even to subject his farm to the most remunerative course of cropping which the terms of that lease will permit. It matters not how severe and exhausting to the soil his treatment of it may prove, the sole consideration with him is what will yield him the largest return. Happily, the conduct of the principal landowners of the county affords the tenant farmers no apology for pursuing such a system as we have supposed. The tenants on most of the large estates, and on many of the small ones, have learned by experience to feel assured that they will, on the expiry of their leases, get an offer of their farms at rents not above current rates, and that therefore they may safely continue to manure as liberally, and clean as thoroughly, as they have been accustomed to do; and they almost invariably act upon this assurance. Liming and any extra improvements are commonly carried out during the first half of the lease; but little or no difference is usually made in the general management towards its close. The influence which such a state of matters as we have described cannot but exert in fostering and maintaining the agricultural advancement of a district, will be apparent to every one; and, moreover, this influence is all the greater from the fact that the landlord's treatment of his tenants is in general discriminating, as well as just and liberal. There are "drones" in the agricultural "hive," as elsewhere; and while the industrious and enterprising meet with every encouragement, the "sluggards" experience little or none.

The general body of the landowners (we say the "general body," for there are exceptions) not only act in this fair and liberal manner by their tenants, but many of them also take a lively personal interest in all practical questions connected with

the mode of culture pursued in the county. Some of them—as the Duke of Buccleuch, Mr Hope Johnstone, Mr Carruthers of Dormont, and Mr Jardine of Castlemilk—have home farms, on which stock of the finest breeds are reared, and the most approved systems of farming pursued. They thus compete with their tenants in rearing the same kind of stock, and in raising the same kind of crops; and have not unfrequently at show dinners to do honour to their own tenants as their successful rivals. Altogether, Dumfriesshire may congratulate itself on the possession of a class of landowners second to none in any other county for considerateness and enlightened liberality.

The general body of the tenant farmers in Dumfriesshire are intelligent and enterprising. They have all received at least as good an education as the parish schools can supply; and the parish schools of this county would bear a favourable comparison with those in any other part of Scotland for the substantial character of the education which they afford. Others have been principally educated in academies and other public seminaries, while a few have received the advantages of a university education. From what we say in a subsequent section, it will be understood that there is much diversity in the general intelligence, refinement, and pecuniary means of the farmers of Dumfriesshire. The sheep-farmers are very generally men of education and capital; and they would bear a favourable comparison with men of their class in any other county. But the arable farms are so different in extent that they are occupied by men of every grade; there is, in fact, as much diversity in the farmers as there is in the size and quality of the farms which they cultivate.

However, the advancement in agriculture which a district or county makes is more largely dependent upon the few than upon the many. When the pioneers of progress have made a decided step in advance, the others, perceiving the pecuniary advantage to be derived from it,—for no change is an improvement in farming unless it yields a larger return,—sooner or later follow in their wake. It has been so in all the great improvements which have been wrought in the agriculture of Dumfriesshire; as, for example, in draining, liming, and in the application of artificial manures; and in the nature of things it must always be so. There are many names "familiar as household words" throughout the county, because of the leading part which their bearers have taken in all agricultural matters, and we could easily quote them here, but there are so many deserving commendation, that the list could not be curtailed within reasonable limits without omitting several which ought not to be passed over; we think it better, therefore, to speak of the tenant farmers in these general terms, without mentioning the names of individuals.

5. The last cause which we would specify as contributing to the advancement of agriculture in Dumfriesshire, is the influence which has been exerted by the various agricultural associations of the county. Shows for the exhibition of cattle and sheep have for many years been held at Moffat, Lockerbie, Annan, Thornhill, Sanquhar, and Langholm, and have had the same influence in improving the quality of the stock in these respective districts which similar shows elsewhere have had. In 1852, a union show, which comprised the counties of Dumfries, Kirkcudbright, and Wigtown, was inaugurated at Dumfries, and has been held every five years since. To explain its object we cannot do better than quote the language of the Earl of Dalkeith, in proposing the toast of the evening at the dinner which wound up the proceedings of the last show (1st October 1867). That noble Lord said, "The show was originated for this purpose, that the different societies of which it is composed, after having had their annual exhibitions, might come together once in the five years, and, by comparison, see the relative progress of their neighbours and themselves. In district shows they saw some men get the first prizes for two or three consecutive years, to the discouragement of others, and perhaps they thought their animals the best in the whole country; but on turning out to the union they found that their neighbours had animals as good, if not superior, to theirs. The importance of this would be fully appreciated by practical men."

But there is another society, whose object is somewhat different from, or, to speak more correctly, more comprehensive than that of any of the associations we have referred to. Its efforts have been so praiseworthy and beneficial that, in specifying the causes which have contributed to the advancement of agriculture in Dumfriesshire, it ought not to be passed over in silence; we refer to the Lockerbie Farmers' Club. The sole object of the other societies is to improve the stock of the county, and they seek to do so by one means—that of shows. The Lockerbie Farmers' Club, however, while not neglecting this very important object, has at the same time other equally important ends in view. The principal object contemplated at its commencement was the discussion among its members of practical questions directly connected with agriculture. It was started in 1848, and as arable farming was in a transition state at that period, the discussions which took place at its periodical meetings produced a most beneficial effect upon the arable farming of the district. But there are two branches of husbandry in which the farmers of Dumfriesshire have achieved no mean reputation, and it is because the Lockerbie Farmers' Club did so much to advance these branches to their present satisfactory condition, that we feel called upon to take such special notice of its opera-

tions ; these are the cultivation of turnips, and the consumption of them upon the land by sheep. Previous to the potato failure turnips were not much grown, at least in the upper districts of Dumfriesshire. When it became apparent that that calamity was permanent, and when, in consequence of the failure, potatoes proved so unremunerative, the attention of arable farmers was earnestly turned to the cultivation of turnips ; but their cultivation was very imperfectly understood, and the crops of them which were produced were comparatively light. This deficiency arose from many causes ; the radical one was the fact that sufficient farm-yard manure could not be produced to raise a good crop, and most farmers had yet to be convinced that the expense incurred in supplementing such manure by bones, guano, and other artificial manures, would be highly remunerative. But there were other points on which much light required to be thrown before turnips could be successfully cultivated. There were, for example, the varieties which would best suit particular districts and elevations, the time at which each variety should be sown, what width of drill and hoeing would yield the heaviest crop. A great revolution of public sentiment on all these points has taken place since turnips began to be extensively cultivated, and we confidently assert that the Lockerbie Farmers' Club was largely instrumental in hastening this change. We say "hastening" this change, for we are far from saying that without their exertions it would not have taken place at all ; all we believe and assert is that, by the practical and decisive steps which that club took, it brought about this improvement much more speedily, at least in that immediate district, than would otherwise have been the case.

To detail all their operations would occupy more space than we can spare. We may merely remark that the turnip crops of the members, and of others who desired it, were weighed every November for twelve consecutive years. A tabulated report was printed and circulated throughout the district, which specified not only the weights, but also the kinds of turnips, width of drill, and of hoeing, quantity of farm-yard manure given, quantity of artificial manure given, distinguishing the different varieties, and the date of sowing. There was appended to the report a condensed summary of the information which another inspection had elicited. The stimulus which it gave to a more liberal application of artificial manures, and the light which it threw on the various important practical points which the inspection embraced, was very great. The credit is due to the members of the club generally, who entered most heartily into the whole scheme, and who, moreover, were not slow to act upon the new information which the periodical inspections elicited. But the intelligent interest which Mr Robert Elliot, Hardgrave (now at

Laighwood, Dunkeld), took in the scheme, and the remarkable crops of turnips which, with a liberal application of artificial manures, and great width of drill and hoeing, he year after year produced, did much to extend an improved style of turnip husbandry.

There is one branch of arable farming in which Dumfriesshire and the eastern part of Kirkcudbright (for the two are similar in this respect) are perhaps about the top of the tree, and that is sheep feeding upon turnips. A high authority ascertained, from returns which he procured about twenty years ago, that turnip-fed one-year-old sheep in this county exceeded in weight and value the best in the Lothians and in Norfolk. Latterly, however, Norfolk and Lincolnshire are treading close upon our heels, as well indeed they may with their superior climate and other advantages. The gentleman referred to is of opinion that there are various arable farmers in the middle of Annandale whose management produces profits from their sheep scarcely equalled anywhere in Britain. The Lockerbie Farmers' Club has helped in no small degree to bring about such a satisfactory state of things. A show of turnip-fed hogs has long been held, under their auspices, at Lockerbie in the April of each year. We shall refer more minutely in a subsequent part of this paper to the weights of the sheep exhibited on these occasions; we merely remark now, that the annual weighing of the hogs, accompanied, as it was for a good many years, with detailed statements of the quantities of turnips, grain, &c., consumed by each sheep, gave a considerable stimulus to the *good feeding* of them, not only over Dumfriesshire, but throughout a large part of Galloway.

SECTION III.—1. *Size of Farms.* 2. *Length of Leases.* 3. *Different kinds of Entries.* 4. *Course of Rotation.*

1. *Size of Farms.*—There are few counties in Scotland where the arable farms vary so much in extent as in Dumfriesshire. In every part of the county are to be found farms of large and small extent, varying as they do from 700 or 800, down to 60 or 70 acres. There are no farms (properly so called) in the county less than 60 or 70 acres in extent, each of which gives employment to one man-servant and one pair of horses. The tendency of late years, however, has been to convert two or more farms into one holding, so that the number of tenant-farmers is becoming less numerous. There are many obvious advantages attending this system of enlargement; as, for example, the established fact that a large farm can be wrought at less expense than the working of the same extent of land divided into several small farms would cost. But while we would regret to see all the farms small, neither would it, in our opinion, be beneficial to

have them all made large. In districts where there is a regular gradation in the size of the farms, a strong inducement is held out for men in every grade to be industrious and careful in their management, so that they may improve their position and their prospects, by becoming lessees of more extensive and more valuable holdings. Nor is this mere theory, for this motive is found to be in practice very influential. Many men, who long acted in the capacity of ordinary farm servants, have by their industry and thrift managed to save sufficient capital to warrant them in becoming offerers for farms of comparatively small extent, while their intelligence, general good conduct, and practical skill have recommended them to the favourable notice of landlords and factors, who are generally not slow to recognise merit, and to encourage such as show a disposition to help themselves. In proof of this, the reporter would cite one case out of many within his own knowledge. A farm of one plough in Upper Annandale became "open" a few years ago. Of the thirteen offerers, there were nine who had "risen from the ranks;" and he has the authority of the agent for saying, that though there were of course differences in their qualifications, "pecuniary and personal," yet not one of them could be objected to on any reasonable ground. Others, again, who commenced life in comparatively small farms, have by the same qualities succeeded in increasing their capital and the extent of land in their possession. And we maintain that the gradation in the size of the farms in Dumfriesshire not only renders this practicable, without the parties having to remove from the same district of the country, but that it also acts as a strong inducement for such men to strive to improve their circumstances, and to endeavour to raise themselves in the social scale. We trust, therefore, that such a gradation as at present prevails may long be continued, for we believe it to be productive of the most beneficial results. There are comparatively few arable farms in the county on which the tenants do not reside, landlords being averse—very properly, we think—to letting *led* farms.

There is a class of holdings of small extent existing on the estate of Mr Hope Johnstone of Annandale, in the parishes of Johnstone and Kirkpatrick-Juxta, which ought not to be passed over in such a report as the present. A very full account of this system appeared in the Transactions of the "Highland and Agricultural Society" for March 1844 and for July 1859, and therefore we do not think it necessary to describe it now, all the more so that justice could not be done to it in the limits now at our disposal.

2. *Length of Leases.*—At the commencement of the period over which the report extends, the leases of most arable farms in Dumfriesshire extended over a period of nineteen years. Fifteen

years is now the more common length, while in a few instances eighteen or nineteen years is the period adopted. It appears to the reporter that this shortening of leases is much to be regretted. When the farms are wrought on a five years' "shift," the farmer has three courses of rotation during the currency of a lease of fifteen years' duration; but when the rotation is a six years' one, he is enabled to go only twice over a part of it. Thus the same encouragement for improvement is not given as would be the case were the leases to extend over a longer period. This is especially true of farms which through any cause happen to be in poor condition at the time when the tenants enter upon them. If the tenant is enterprising and liberal in his management, he must sink a good deal of capital during the course of his first rotation. It is only at the end of that time that he begins to reap the benefit of his outlaid capital, and a comparatively limited period remains during which he has an opportunity of reaping it. We apprehend, therefore, that short leases, even when they extend to fifteen years, operate as a check to improvement. They are practically lengthened on some estates, however, by the occupants being offered a new lease a year or two before the former one expires. Such a system not only prevents the farmer from impoverishing his land at the end of his lease, but further enables him to resume his improvements with increased liberality and vigour. It will scarcely be necessary to add that these remarks are not meant to refer to sheep farms, for a long lease is not so important in their case as in that of strictly arable farms.

3. *Kinds of Entries.*—There are three principal kinds of *entries* common in Dumfriesshire, the nature of which we shall now explain, afterwards pointing out the respective advantages and disadvantages of each. The first of these is what is usually called the *Candlemas* entry. In this case the tenant enters upon the land which falls to be in crop at Candlemas, and he gets possession of the house and grass lands at Whitsunday. He is usually called upon to pay his first half-year's rent about January or February.

Then, secondly, there is the *Whitsunday* entry, under which the tenant gets possession of the whole farm at that term, with the exception of that part of it which is under grain crops. The tenant usually pays for the grass and clover seeds sown during the preceding year, if they were not pastured after the cutting of the grain crops in autumn. He either provides the seeds to be sown along with the grain crop which belongs to the outgoing tenant, or pays for them at valuation. It is not uncommon to bind the outgoing tenant to offer to hand over the whole or a part of the growing (white) crop to the incoming tenant, at a valuation fixed by persons mutually chosen, and in the event of his offer not being accepted on these terms, he has liberty to sell

it by auction. When the entry is a Whitsunday one, the rent is payable in November, but it is not usually taken until January or February.

And, thirdly, there is the *Martinmas* entry. Under this system the tenant gets possession of the whole farm at Martinmas, with the exception of that portion of it on which turnips are growing; but the owner of these is bound to have them removed or consumed in time to allow the land to be ploughed for the succeeding white crop. The one party is generally bound to hand over to the other so much of the unthrashed grain crop as may not have been consumed, with the view of preventing the straw being removed from the farm. The rent could be legally demanded at Whitsunday, but it is not customary to require payment of it before August.

The Martinmas entries are not numerous, Lord Mansfield's estate being the only large one on which it is found. The remainder of the county is almost equally divided between the Whitsunday and Candlemas systems, the former being slightly the more numerous. The entries on the Annandale estate and on most of the estates in Nithsdale are at Whitsunday, whereas on the estate of Jardine Hall, and on the estates in middle and lower Annandale, Candlemas is the term of entry. In the case of all sheep farms, the entry is at Whitsunday. But although the Whitsunday entry is so general, it is, we think, the least favourable for the tenant. Under it he must have a larger capital than would be necessary under either of the other two systems, as he is nearly eighteen months in possession before he reaps a grain crop. At all events, that long period elapses before he can dispose of any considerable portion of it in the market. He has thus only his green crop and pasture during the whole of that time, and both of these together will do little more than defray the working expenses of the farm. The Martinmas and Candlemas entries are evidently the most advantageous for the occupant, as under them he reaps the first white crop, and has no outlay in connection with it, except the expenses of ploughing and seed. The very fact that it requires a large capital to enter upon a farm at Whitsunday, is what recommends this entry most strongly to landlords. They believe that under this system they get more substantial tenants, and that, therefore, they have a greater security for their rent than when the entry is either at Martinmas or Candlemas. But many high authorities are of opinion that the security is as good as could be desired when you have in the offerer personal character and practical skill, along with the possession of a moderate amount of capital. However, there are obvious difficulties of a serious nature in the way of changing the term of entry in the case of any farm which passes directly from one tenant's possession into that of another.

4. *Course of Rotation.*—Though the county is remarkably diversified in respect of both soil and climate, yet the rotation pursued is almost identical in every part of it. Indeed, the order of cropping followed is always the same, the only difference being in the length of time during which the land is allowed to remain in pasture. The order is as follows:—1st year, grain, always oats; second year, green crop; third year, grain (oats), and very occasionally barley or wheat, with grass and clover seeds; 4th year, hay or pasture, and on some farms only one additional year of pasture, and on others two years. In the former case a five years' rotation is acted on, and in the latter a six years' one. The tendency has been of late years to shorten the rotation, which we think is much to be regretted, all the more so that, as we shall find by-and-by, such a frequent recurrence of green cropping increases the probability of sustaining the damage caused by the disease commonly called "finger-and-toe." The six years' system is pursued on the estate of Annandale and on some others, while the five years' rotation is followed on the estates of the Duke of Buccleuch, Mr Carruthers of Dormont, Sir Alexander Grierson, Mr Paterson of Brocklehirst, &c. Although the farms on the Annandale estate are managed on a six years' rotation, yet liberty is given to the tenants to pursue what course they choose at the middle of the lease, the only restriction being that the farm be left according to the six years' plan at the close.

The reporter has made a calculation, based on the statistics collected by the Inland Revenue in 1866, which shows that two-thirds of the arable farms of the county are wrought on a five years' rotation, while only one-third of them are managed on the six years' plan. The calculation is as follows:—

Total under grain crops,	49,577	acres.
„ green crops,	26,974	„
„ fallow,	5,039	„
„ artificial grasses,	50,449	„
Total under rotation,	132,039	acres.

It may be assumed that one-half of the extent of the grain crops represents the number of acres broken up from lea every year. If then 132,039 (total acres under rotation) be divided by 24,788 (being estimated grain crop after lea), it will give almost exactly $5\frac{1}{3}$, which is thus the average rotation pursued over the whole county. But if the arable farms be managed, some on a five years' rotation and others on a six years' one, and if the average be, as we have seen, $5\frac{1}{3}$, then it follows that two-thirds must be wrought on the five years' "shift," and the remaining one-third on the six years' plan.

Five and twenty years ago it was not uncommon to take two white crops in succession after the land was broken up from pasture, but this practice has grown gradually into disuse, until now it is seldom to be found, and that only in cases where the crop is taken from land long out of rotation. Where this plan was permitted the tenant was generally bound, by the terms of the lease, to allow his land to remain longer in pasture than is common under the present system. Thus, although the method appears at first sight beneficial to the occupier, yet it was in reality more advantageous for the landlord, for the "rest" which the soil got while in pasture had the effect of improving its condition.

Section IV.—*Corn Crops.*

In 1866 there were 132,039 acres under rotation in the county. These were divided as follows:—49,577 acres of corn crops; 26,974 acres of green crops; 5039 acres of bare fallow; 50,449 acres under clover and artificial and other grasses under rotation. There must be added to the above 72,550 acres of permanent pasture, meadow or grass not broken up in rotation (exclusive of hill pastures). The total of acreage, then, under all kinds of crops, bare fallow and grass, amounts to 204,589. Thus the percentage of corn crops of the whole acreage, under all kinds of crops, bare fallow and grass, is 24·2. Only five counties in Scotland have a lower percentage of corn crops in relation to the whole under rotation and in permanent pasture than Dumfriesshire has. These are Renfrew, 23·6; Selkirk, 23·5; Ayr, 23·2; Kirkcudbright, 21·3; Argyle, 20·6. The percentage in many of the remaining counties is very much higher. We give a few examples of the highest:—Clackmannan, 42·1; Haddington, 41·6; Fife, 40·8; Forfar, 40·7; Kincardine, 40·1; Elgin or Moray, 39·5; Banff, 38·9; Ross, 38·1; Aberdeen, 37·5; Edinburgh, 35·3, &c.

The 49,577 acres of corn crops comprise the following varieties:—Wheat, 962 acres; barley or bere, 1031 acres; oats, 47,338 acres; rye, 58 acres; beans, 164 acres; peas, 24 acres.

As oats are the most largely cultivated corn crop, we shall treat of them at the outset. There were, as we have seen, 47,338 acres of oats in the county in 1866, being 95·4 per cent. of the whole corn crops grown within its bounds during that year. Many varieties of oats are grown. "Potato" oats used to be very extensively sown in most parts of the county—in all, indeed except the higher districts. Latterly, however, this variety has greatly diminished, and is not much found, unless in the lower districts, within six or eight miles of the Solway. "Sandy" and "Early Angus," occupy the greatest breadth at the present time.

"Berlie" is also grown a good deal; and in elevated and poor localities Barbachlaw or "Tam Finlay" is much used, and found to answer well.

Much of the seed is brought from the Lothians, but it is commonly preferred after having been grown in the district for a season, as it has become acclimatised. The seed for the higher districts is often procured in the lower.

In a county where there is so much variety, both in respect of soil and climate, it would be rash to attempt an estimate of the average number of bushels per acre and the average weight per bushel. Dumfriesshire is, on account of the quantity of moisture which yearly falls, not a first-class grain county. This is especially true of the higher districts, where, as we saw in a previous section, the rainfall, especially during the summer and autumn, is very great. In the parishes towards the Solway the climate is drier and warmer, and therefore the quantity and quality of the grain produced exceed that grown in the inland parts. The largest single tract of good grain land is that stretching from Mouswald Church until a little north of Tinwald Church, extending to about eight miles in length, by an average of one and a-half mile in breadth. Oats until recently were universally sown broad-cast from the hand. Latterly, however, sowing machines are getting into favour and becoming more generally used. They are so highly advantageous in every respect, both as regards speed and regularity, that they are certain to become much more common. Their advantage is especially manifest in the sowing of grass and clover seeds, which are difficult to sow from the hand unless in the most favourable circumstances, and it is quite impossible to sow them satisfactorily in this way in windy weather. Oats are usually sown on the better class of land at the rate of five and a-half to six bushels per Scots acre, and on the poorer soils fully six bushels are given. A few farmers begin to sow about the middle of March if the weather permits, but a very common period to commence is the 20th of that month. Much, however, depends on the state of the weather and on the character of the season.

Grass and clover seeds are sown along with the corn after the green crops. About two bushels of ryegrass seed is usually sown on each Scots acre, though some farmers, especially if neither the land nor the seed is very good, give a bushel or half a bushel more. The quantity and kinds of clover seeds sown vary a good deal. The practice is so various that it would be impossible to state the different quantities within reasonable limits. We are persuaded, however, and we know it is the opinion of many good judges, that as a rule too small a quantity of clover seeds is given.

The quantity of wheat and of barley or bere grown in Dum-

friesshire is very nearly the same, the latter having fully the greater breadth. The exact extent of each in 1866 was, barley or bere, 1031 acres; wheat, 962 acres.

Soon after the commencement of the present century wheat began to be extensively cultivated in the county, and continued to stand high in the favour of practical agriculturists until about 1830, after which a gradually decreasing breadth of it was grown. A very extensive and accurate observer records in an Agricultural Report, published in the "Dumfries Herald" in 1838, that "taking a retrospect of the results of a number of years on a good arable farm, not more than 200 feet above sea level, it may be held a fair rule for the farmer to have from one-third to one-fourth of his fallow and green crop break in wheat." This will give the reader, who is acquainted with the county, a pretty definite idea of the extent of this crop at that period. Immediately after, however, from various causes, the chief of which were the extension of turnips and a succession of unfavourable seasons, its cultivation became very much less extensive, and it has continued steadily to decrease. In 1855 there were 3244½ imperial acres, whereas, as stated above, there were in 1866 only 962 acres. The extension of turnips tended to lessen the breadth of wheat, inasmuch as these could not be consumed so early as to allow the wheat to be sown in time. The land which was in potatoes and in fallow used to be that on which wheat was sown.

Barley was also very extensively cultivated at the commencement of the present century, and continued long in favour; but it, like wheat, also gradually decreased, although it continued to be grown, at least on what are familiarly styled the "barley soils," to a later period than wheat. In 1855 there were 2578 imperial acres of this crop, while, as we have seen, 1031 was the acreage in 1866. Many causes have led to lessen the extent of this crop. One is the fact, that unless on the best "barley soils" it has proved a very uncertain crop, the produce per acre and weight per bushel being frequently very small. Another is the superiority of oat-straw over that of barley, and especially since the introduction of the dairy system much weight has been attached to this consideration.

Rye, beans, and peas are not much grown. The breadth of each in 1866 was as follows:—Rye, 58 acres; beans, 164 acres; and peas, 24 acres.

Having treated of the kinds and proportions of corn crops which are grown in Dumfriesshire, we proceed to describe the manner in which they are cut, dried in the fields, stored in the stack-yard, thrashed, and disposed of in the market. As to the first of these, namely, the cutting, it may be remarked that at the commencement of the period over which this report extends,

the "sickle" was being gradually superseded by the "scythe;" and now, at the close of it, the latter implement is giving place, in some measure, to the "reaping machine." There are two principal circumstances which will limit the use of the reaping machine in this county. The one is, the steep character of a considerable portion of the cropping land; and the other is the fact that a good deal of the grain, especially in upper Annandale, and in such high districts, is very much "lodged." The reporter has frequently seen twenty-acre fields, in the district above referred to, almost as flat as a road; it is needless to say that, in cases such as these, the reaping machine would be practically useless. It frequently happens that although the crop on most of a field is standing, portions of it here and there are flattened, and as the machine would be interrupted by such places, we believe it would be cheaper and more expeditious to cut down the whole by the scythe. In the lower portions of the county, again, the grain crops seldom, even in moist seasons, are so laid as to prevent their being cut by the machine. Although they are lodged to some extent, they very rarely become so flattened as to interfere with the filling of the grain, and a machine, when made to cut in the opposite direction to that in which the straw is inclined, will make tolerably good work.

The grain is generally put up in "stooks" of from eight to twelve sheaves, sometimes with and sometimes without hoods; it is certainly becoming more common to dispense with the hoods. "Hutting" in the fields is very rarely resorted to, even in the worst seasons, in Dumfriesshire. The crop is taken direct from the stook to the barn-yard, and there stored in stacks, which are universally built in a circular form. The size of these stacks varies on the same farm according to the state of the weather, and the consequent condition of the grain when put up; and their size on different farms is generally regulated by the size of the barn—as much being put into each stack as that building will contain. Sheds are being erected on many farms for the purpose of storing hay and unthrashed grain; they were at first used almost exclusively for hay, but sheds have latterly been erected on several farms expressly for holding the grain. Their principal recommendation when used for storing the white crop is that the straw, which is used in thatching and roping stacks, is saved, as well as the time which is spent in preparing it for these purposes; and, moreover, the grain is perfectly secure the moment it is put into the shed, whereas it is always liable to suffer from wet when in stack until the thatch is put upon it, which process may necessarily be delayed for some days. Their chief advantage in the case of hay, is that the hay, instead of being put up in "stamp coles" in the field, can be stored in the shed at once; thus not only rendering the process of

"thatching and roping" unnecessary (thereby saving labour and material), but also saving the work of putting it up in the field. They are generally made 18 feet wide and 12 feet high; the length being, of course, regulated by the quantity of crop which it is intended they should contain. A shed 18 feet wide, 12 feet high, 60 feet long, with wooden posts, and slated, would cost about L.45; so that a shed of the width and height we have specified, would cost about 15s. per lineal foot. The above estimate does not include the carting of the materials, which, it is presumed, will be done in all cases by the tenant. On estates where good timber is plentiful, the proprietor might provide the wood and slates, while the tenant might reasonably be expected to cart the materials, and pay the wages of the tradesmen who erect them. Many have already been erected in the county on these terms, and we hope to hear of this arrangement being acted on in many more instances. On the estate of Corrie, the proprietor erects substantial hay barns, with cast-metal columns, and the tenants pay five per cent. on the outlay. They are built 12 feet high to the wall-plate, and 17 feet wide, and are boarded down about 5 feet from the wall-plate, and cost about L.1, 1s. per lineal foot; in other words, a shed 100 feet long (which will hold about 6000 stones of hay) will cost about L.105. Before passing from this subject, we would mention a plan of a shed which is adopted at Townhead, Mouswald, and which appears to us to be a very good one. The shed is 18 feet high from the ground to the top of the posts. Nine feet from the ground, it is partially boarded with strong slabs. The lower portion, to which is attached a large court-yard, is used as a shed in which 30 young store cattle are kept during winter; while the upper portion is used for storing unthrashed grain. This plan is peculiarly advantageous when the farm-steading, as is often the case in Dumfriesshire, is situated on an incline. The court-yard can be made to extend down the slope, while the upper part of the shed can be more easily reached from the rising ground behind.

Water, steam, and horse power are each called into requisition in thrashing the grain crop. Water is employed whenever practicable, as being the cheapest agency that can be used; and, on account of the undulating character of a considerable portion of the county, it is largely available. On many large farms where water-power cannot be commanded, steam-engines have been erected; so that the chimney-stalks, which are such familiar objects in mining districts, are to be seen here and there throughout a county where the air is pure and bracing. A considerable portion of the grain—at least the oats—grown is consumed on the farms on which it is produced. As we shall find by-and-by, when treating of sheep and cattle feeding, oats

are given to both these kinds of stock, especially in seasons when markets are low. When oats are given to cattle, they are generally bruised; and it is not uncommon for farmers to have bruising machines attached to their thrashing-mills. Such of the surplus stock of grain as is not bought by the millers in each district, is sold in the Dumfries and Carlisle markets. A large number of farmers in the lower part of the county have long been in the habit of disposing of their grain at the latter place. The grain market used long to be held at the centre of the principal street in Dumfries, and was, on that account, very unsatisfactory. Grain dealers from a distance, and especially such as came from the other side of the Border, justly complained that when they attended the Dumfries market, they had no means of ascertaining who had grain for sale, as there was no place where samples could be exposed; hence they absented themselves, and thereby lessened the competition. In the autumn of 1866, a committee of gentlemen was formed with the view of organising a grain market, which should be held in a hall, situated in some central locality, and which should also be confined to a limited time. One difficulty was at once surmounted by Mr James Sloan generously placing the Market Hall at their disposal. It is situated in the immediate vicinity of the Cattle Market, and there a regular sample market has been conducted for the last twelve months. This arrangement has answered the purpose admirably; and the reporter would venture to express the earnest hope that nothing will be awanting on the part of the producers to make it still more successful. An open sample market is unquestionably for the benefit of the farmer, for it enables him to submit his article to the inspection of a greater number of purchasers than was possible under the previous system, and he thus reaps the advantage which competition never fails to carry along with it.

Until about twenty-five years ago, a large quantity of grain—wheat, barley, and oats—used to be sent out of the county from the ports of Annan and Dumfries. Previous to that time, the Dumfriesshire arable farmer depended on three sources for the payment of his rent—grain, pork (in the feeding of which the green crop was mainly consumed), and young cattle. Now, the first source of revenue is not much looked to, at least directly. The greater portion of it is given to sheep and cattle, to prepare them for the fat market. Moreover, not only is little grain now exported, but large quantities of feeding stuffs, such as Indian and bean meals, are imported; thus showing how speedily and completely the practice of a district, in regard to such things, may change.

SECTION V.—*Green Crop Cultivation. Potatoes and Turnips; and Consumption of the latter upon the Land by Sheep.*

1. *Potatoes.*—Five and twenty years ago a good deal of the land which is now under green crop was allowed to lie fallow. At the present time almost none of the strictly arable land is left in that unproductive state. The only "bare fallow" now is land which is in process of being reclaimed, and which after being ploughed is left in that condition for a season. It appears from the Government Returns of 1866 that there were 5039 acres of "bare fallow" in the county in that year. But we doubt very much the correctness of the return, as no arable land which is under ordinary management is permitted to remain uncropped. We are confirmed in our opinion as to the inaccuracy of the above return by finding that the Highland Society Return of 1856 gives only 352 acres in "bare fallow." Possibly there is a clerical error in the last Inland Revenue Return, and it should stand 539 acres. The most of the green crop grown in the county five and twenty years ago consisted of potatoes. As remarked under a previous section, the soil was well adapted for that root, and large quantities of them were grown. This was more particularly the case in the middle and upper districts, where turnip husbandry was not much practised. In the lower districts, however, this latter crop was year by year being more extensively cultivated. By degrees the growing of turnips became better understood, until a large proportion of what had hitherto been devoted to the production of potatoes, and the whole of the fallow land also, were employed to raise turnips. In 1866, there were about four acres of turnips in the county for every acre of potatoes, the exact extent of each being—potatoes, 5173 acres; turnips, 20,300 acres. A few farmers in the neighbourhood of Dumfries have of late years been in the habit of growing potatoes for the early market. They are purchased by dealers and sent to Newcastle and Glasgow, but this system is not carried on to a large extent. It was long customary to use no other except farm-yard manure in the production of this crop, but now it is usual to supplement it by the application of various kinds of artificial manures.

2. *Turnip Cultivation.*—Turnips have become an extremely important crop to the Dumfriesshire arable farmer; not that they directly yield him such a large return, for when the manure and labour spent upon them are taken into account, the clear profit is considerably reduced; but they help to clean the land, and when eaten off by sheep, which, as we shall see by-and-by, a large proportion of them generally are, they so enrich and consolidate it that their importance can scarcely be over-

estimated. In fact, it is difficult to understand how the Dumfriesshire arable farmer could get on without this crop.

There were, as remarked above, 20,300 imperial acres of turnips grown in the county in 1866. It is difficult to arrive at a probable estimate what proportion of these may be swedes and what proportion other varieties, as there is not only a difference in this respect between the different parts of the county, but farmers even in the same district vary in the proportions which they sow of each. In the lower portion of the county about one-half of the turnips sown are generally swedes, whereas in the upper districts certainly not more than one-third, and probably only one-fourth, are of this variety. It is generally observed that the quantity of swedes grown in the higher districts is gradually lessening. It is found that on farms 400 or 500 feet above the level of the sea the temperature is too low to produce a full crop of them. We believe we are not far wrong in estimating the swedes at from one-third to one-fourth of the whole grown. The other varieties are white, yellow, &c. The white variety is generally grown for consumption in October and November, and when early sown a very large crop is commonly produced. The swedes are preferred for spring use, as being hardy they keep better than the softer kinds. When early sown as much weight of them can be produced as of almost any other variety, and it is found that they feed further in proportion to size and weight than the other sorts.

The land which is intended for green crop is ploughed from the stubble in October and November. Autumn cleaning of land intended for green crop is not much practised in Dumfriesshire. With regard to the process of cleaning, we may simply remark that the grubber has of late years been more used than was customary fifteen or twenty years ago. There is no department of husbandry in which the Dumfriesshire arable farmers have made so much progress as turnip cultivation. Take, for example, the matter of manuring. The reporter has before him a summary of answers to queries, which were addressed in 1842 to about a dozen of the leading agriculturists of the county in regard to the cultivation of this crop by a gentleman, whom we have had frequent occasion to refer to by name and otherwise in this report, and who is universally admitted to have done more in very many ways to promote the advancement of the agriculture of Dumfriesshire than any other man, namely, Charles Stewart, Esq., Hillside. From these answers it appears that in the case of ordinary farms in 1842 not more than 14 or 15 yards of well-rotted farm-yard manure, or 20 bushels of bones, were applied. These gentlemen all agree in opinion that the average produce of good arable land rented at 30s. per acre, and not over 300 feet above sea level, would not be more

than thirteen tons per Scotch acre. One of the gentlemen (the late Mr William Currie, Pumplaburn), who "took" large quantities of turnips to be consumed by sheep, mentions in his reply that the turnips he took (and for which he paid an average price of fourpence per week for each sheep), would yield their owners from 30s. to L.3 per Scotch acre, and that there was only one instance in which they yielded L.5. These facts will give the reader some idea of the backward state of turnip cultivation at the commencement of the period over which this report extends. Immediately after that time, guano, bones, and other artificial manures, became used more generally and in larger quantities. This increase has steadily continued, as its advantage has become more manifest, until now a considerable quantity of artificial manure is applied by almost all farmers, and a very large quantity is given by some. This is in addition to the farm-yard manure, which, it ought to be mentioned, is much better in quality than formerly, in consequence of the feeding stuffs and turnips which are given to all kinds of cattle. It is difficult to say how much the produce has been increased on land of the quality specified above, in consequence of the more liberal application of artificial manures; but we think we are not far from the mark when we estimate that increase at from five to six tons (or nearly one-half more) per Scotch acre. The immediate profit of this is easy of calculation; but there is a further profit, inasmuch as these additional turnips will do much to enrich the land, whether they be consumed upon the field by sheep or at the farm steading by cattle.

The drills vary in width from 26 to 30 inches, the most common width being from 27 to 29 inches. From 1840 to 1850 the great majority of farmers hoed their turnips at a distance of from 7 to 8 inches apart and even less. Mr Elliot, Hardgrave, was the first to hoe at the distance of 12 to 13 inches, and the very heavy crops which he produced by this system did much to convince turnip cultivators of the advantage of wide hoeing. The reporter has found, from an examination of the tables of weights published by the "Lockerbie Farmers' Club," that whereas in 1849 the ordinary width was 7 to 8 inches, it increased in one year to 10 to 12 inches, and it is not too much to say that this is to be accounted for by a publication of the success of Mr Elliot's plan. Latterly, however, they are being generally hoed slightly closer than was customary ten years ago, the reason being that moderately-sized turnips are found to keep better during winter than very large ones. The sowing of swedes is usually proceeded with about the middle of May, if the weather permits; and the time of sowing his turnips is really a very busy and anxious one with the Dumfriesshire arable farmer. He has learned by experience that the growth

of the crop depends so very much upon the weather and the condition of the land, that his anxiety is not much less than during harvest.

Two causes have rendered the growth of the turnip crop in Dumfriesshire, as in other counties, less certain than it would otherwise be. The one is the ravages of the fly upon the leaves of the recently brairded plants, and the other is the disease commonly called "finger-and-toe." No preventive for the former has been discovered so far as we are aware, but certain measures are found to prevent, in a large degree, the latter. It has commonly been observed that "finger-and-toe" is most prevalent and destructive on undrained or defectively drained land, and on farms where the rotation of green crops is very frequent. An obvious preventative, therefore, to the disease is thorough drainage and a less frequent rotation. Lime, put upon the stubble after the lea crop, is a means which has often proved effective in guarding against this disease. Another promoting cause of the disease is giving affected turnips to sheep or cattle upon lea or stubble which is about to be ploughed up for green cropping. The reporter is aware of several who, after lengthened and careful observations, have never known this fail in bringing on the disease.

A portion of the turnips are removed from the fields and given to the cattle in the sheds and byres. The proportion of the whole lifted for this purpose varies on different farms and in the various districts of the county. Some take two furrows, leaving four, thus removing one-third of the whole; others take two furrows, leaving three, thus removing two-fifths of the whole; while a third plan is to take exactly one-half of the crop. We would estimate the proportion removed from the field and consumed by cattle at two-fifths of the whole produced.

3. *Consumption of Turnips upon the land by Sheep.*—The remaining three-fifths are eaten off by sheep. There are two principal advantages which result from this system. On the one hand, the droppings from the sheep enrich the land very materially; and on the other, the treading of the sheep consolidates the land, which has a tendency to become too loose in consequence of the system of frequent rotation which is pursued. The soil is very generally well adapted for feeding sheep in this way, being porous, and thus the sheep have almost always, even in wet weather, a comparatively dry bed. Some are, however, of opinion that although the soil is on the whole well adapted for sheep feeding on turnips, yet that too large a proportion of this crop is consumed by white stock. It is held by such that it would be much more profitable to give the land a larger quantity of manure when the crop is sown than is customary, to give a greater proportion of the turnips to cattle (in the sheds) which

yield a better return than sheep, and to consume only as much of the crop by the latter as would consolidate the land. Part of the additional manure, by this system, would be supplied by the increased number of cattle which could be kept; and it is alleged, moreover, that frequently a large proportion of the droppings from the sheep are washed away and thereby lost. The reporter does not mean to enter on a discussion of the merits of this theory, merely remarking that it is deserving of careful consideration, and that their indisposition to apply manure liberally at the time of sowing would lead many to reject it.

The sheep are penned upon the turnips in October and November, the white and yellow varieties being generally consumed first. After Christmas, the turnips, before being given to the sheep, are almost universally cut into long thin pieces by a machine, and eaten out of wooden troughs made for the purpose. This method has the threefold advantage of supplying the turnips in a form in which they are easily masticated, of causing them all to be eaten, thereby preventing the waste which unavoidably takes place when they are consumed in an uncut condition, and of keeping them very clean. In fact, some farmers, whose land is of a sandy description, are so particular as to have their turnips washed before they are put into the cutting machine.

The greater proportion of the turnips given to sheep after Christmas, except those intended to be consumed by Highland wethers and other old sheep, are *stored* in a variety of ways. The simplest method adopted is to go through them with a plough so as to get the bulbs well covered over with earth. Another plan, which very commonly prevails, and which has been found to answer well, is, after cutting off the shaws and roots, to store the bulbs in pits, each containing between one and two cart-loads, the pits being covered over with a little straw and a thin coating of earth. The straw, however, is quite unnecessary. Where this method is adopted the pits are arranged in rows, so that the sheep bars may be placed alongside of a row of pits. A third plan is, to draw a furrow with a single-moulded plough, and having pulled the turnips to throw them into the furrow as pulled, the plough being again used for the purpose of covering them. The plough is once more called into requisition to turn them up during winter as required. The quantity stored in one way or another throughout the county varies from year to year. The reporter has never failed to observe that a short succession of open seasons has the effect of inspiring many farmers with too great a confidence in the mildness of the seasons, as evidenced in their leaving a large portion of their turnips unstored. Just as in the commercial world, it seems to require a crisis every few years (some say seven) to check the spirit of reckless speculation which gets

abroad, so many farmers are not made sufficiently careful and cautious in the matter of storing their turnips without now and again suffering the loss which an unusually severe winter entails.

Artificial food is often given to the sheep along with the turnips. Several advantages result from giving them a liberal supply of such food. One obvious one is, that stock is thereby made more speedily fit for the fat market, and thus capital is more speedily turned over. Further, when cake or grain is given, the clip of wool is better in respect of both quantity and quality than when the sheep are fed on turnips alone. Again, as we shall see by-and-by, the quantity of turnips consumed is diminished as the amount of artificial food given is increased. Another advantage, which is not the less important that it is not so apparent, is that the droppings of the sheep, being enriched in proportion to the quantity of artificial food given, increase the value of the succeeding white crop. We have heard this estimated by a good authority as equal to one-half of the outlay in such food. This may be an exaggerated estimate, but we are persuaded that sheep feeders generally are not sufficiently alive to the benefits resulting from this practice.

As remarked under a previous section, Dumfriesshire stands at the top of the tree in the practice of sheep feeding upon turnips. The best class of sheep that are fed upon them are the half-bred lambs which are reared on the arable farms. Many arable farmers purchase the five and six-year-old Cheviot ewes from the hill stocks, and take delivery of them about the beginning of October. They are put to Leicester tups, and yield about one and one-third lambs on an average. These are weaned about the 10th or 12th of August; and the ewes, having been fed upon grass and turnips, are principally sent to the fat market about January, and generally weigh about sixteen pounds per quarter. The clip of wool taken from them the preceding summer may weigh four pounds. A few farmers are in the habit of selecting about one-half of the best of the lambs so produced on the low lands and feeding them separately. When put upon the turnips in October they may weigh about eleven pounds per quarter. The white varieties are consumed first, but from the middle of November until the 1st of February they feed upon the yellow kinds, and afterwards they are put upon the swedes. In the lower districts, where that variety is more extensively grown, they are put upon swedes as early as Christmas. So long as sheep of this class get no artificial food they will each consume about twenty-eight pounds of turnips per day, but if one and a-half pound of oats are given per day to each, the consumption of turnips will be reduced to about eighteen pounds. When fed in the manner now specified, the above quantity of oats being

given them from the 1st of January to the end of April, they may be expected at the latter date to weigh about nineteen pounds per quarter, and to yield a fleece of eight and a-half pounds. The above figures are quoted on the authority of an eminent sheep feeder, who, throughout a lengthened experience, has been most minute and exact in his observations. To produce such results, however, great care and attention must be spent upon them; and, in fact, unless this is done, sheep feeding on turnips can never be highly successful.

The greater number of the half-bred (Leicester and Cheviot) lambs that are fed in the county are from the hill stocks, and they are of a less size, and consume a smaller weight of turnips, than the heavy ones of which we have just been speaking. Twenty to twenty-four pounds per day is the quantity usually consumed by this class of stock when no grain is given. It is customary to give them about two imperial bushels of oats each in the course of the winter. They usually get the oats for the first time about the 1st of January, and from one-half to three-quarters of a pound per day is an ordinary allowance for each sheep.

Reference has been made in a previous section to the prizes which have long been given for the best turnip-fed sheep, at the annual show under the auspices of the Lockerbie Farmers' Club. We append an abstract of the table of the weights of the prize sheep for the last twenty-two years. It will be observed that the competitions embraced two classes of sheep, the one being one-year-old half-bred hogs, and the others one-year-old Cheviot wedder hogs. The show is held about the middle of April.

(1.) *One-year-old Half-bred Hogs.*—Average weight of heaviest 20 sheep for twenty-two years, 163 lbs.; average weight of heaviest 20 sheep in one year (1865), 180 lbs.; average of heaviest single sheep for twenty-two years, 186½ lbs.; heaviest single sheep ever exhibited (1862), 215 lbs.

(2.) *One-year-old Cheviot Wedder Hogs.*—Average weight of heaviest 20 sheep for twenty-two years, 114 lbs.; average of heaviest 20 sheep in one year (1855), 131 lbs.; average of heaviest single sheep for twenty-two years, 132 lbs.; heaviest single sheep ever exhibited (1855), 155 lbs.

Section VI.—*Grass Lands. Clover and Artificial and other Grasses under Rotation.*

We come now to treat of the management of such pasture land as is under regular rotation. There were, as we have seen, 50,449 acres of the county under this kind of pasture in 1866. As explained under the section on corn crops, grass seeds are always sown with the grain after green cropping. In the

succeeding year, part of these "seeds" are pastured, and part of them kept for hay. The proportion used for these respective purposes varies from year to year. The extent kept for cutting is principally dependent upon the state of the hog market in April. If the demand for hogs is not good at that period, the farmers who have wintered them are induced to put them upon their young grass rather than accept of the small prices which are offered for them. In the average of seasons, fully less than one-half is reserved for hay, while the remainder is pastured. The practice of seeding rye-grass hay, which prevails to such a large extent in Ayrshire, is happily very little followed in Dumfriesshire. We say "happily," because it is a practice which is most hurtful to the land. Scarcely as much rye-grass seed is preserved as is sufficient to supply the wants of the county. It is customary for most farmers to preserve as much seed as will suffice to sow their own lands, and a few bags are commonly exchanged or purchased, with the view of securing a change of seed. The hay, or part of it, produced from this new seed is preserved for seeding purposes in the succeeding year. The above is a pretty accurate account of the practice pursued over the county generally, although it should be borne in mind that there are a few exceptions—some keeping no seed, and others preserving a large quantity.

Permanent Pasture.—It appears from the Government Return of 1866, that the extent of land in Dumfriesshire in permanent pasture is very great; in fact, so great that the return must be meant to include Lochar Moss and other waste land of a similar nature. The total acreage under permanent pasture (meadow or grass not broken up in rotation) amounted at that time to 72,550. This is exclusive of hill pastures. Lochar Moss, which (with the exception of small parts of it on the outskirts which have been reclaimed) is quite unproductive, measures several thousand acres; so that if it and land of a similar nature, of which there are patches here and there all over the county, were deducted from the above, the extent of permanent pasture of any value would be very much reduced. The grass land not broken up in rotation may be divided into two parts: the first includes all land which, being either naturally dry or drained, is *pastured* "all the year round;" the other part comprehends meadow land which has been only partially drained, and off which the hay is *cut* every autumn. A large number of even the arable farms in the county, especially in the higher districts, include patches of both kinds within their bounds. There are few counties in Scotland that have such a variety in the nature and quality of the soil, even on the same farm, as Dumfriesshire. From the undulating character of much of the county, there is sometimes a great difference in the altitude of separate parts of the same

arable farm; hence the management which is most suitable for the lower portion of it may be ill adapted for the higher, seeing that the soil and climate are alike so different. In such cases, it is not uncommon to keep the lower portion under regular rotation, and to allow the higher to remain in permanent pasture. There are other districts of the county again, such as Corrie, which are too high above sea level, and too moist, for grain crops to be cultivated with profit, and accordingly these districts are kept principally in grass. Around most of the mansion-houses in the county there are numerous "grass parks," which are usually "let" in spring by auction. These are principally taken by the cattle and sheep dealers, and sometimes by farmers, who use them for grazing their young breeding-stock. Such are the principal varieties of the one kind of permanent pasture which prevail in Dumfriesshire. When we come to treat of draining and liming, we shall have our attention directed to the means which are employed to keep such land in good condition. We merely remark now, that the greater part of what is kept in permanent pasture is well adapted for grazing purposes; in fact, Dumfriesshire is well known as a capital grazing county; the very moisture which prevents it from being a good grain-growing district, helps the growth of grass. Much of the pasture is, in consequence, rich and luxuriant A large proportion of the permanent pasture is situated in the higher parts of the county, where the rainfall is very plentiful. Top-dressing with lime and other manures takes effect very speedily, and increases the value of the pasture.

There is a method sometimes adopted for laying down permanent pasture which, though not entirely new, was not until recently practised to any large extent, and that is, to sow grass and clover seeds after turnips, without a white crop, There can be no question as to the advantage of this system, where the pasture is intended to be permanent. It does not yield such a large return during the first year as is done by a grain crop, but the loss is only temporary, for an ample compensation is afforded by the superior quality of the pasture in subsequent years. The grass and clover seeds, to which is added a little rape seed, are sown in the end of April or beginning of May, and sheep are usually put upon the field about the middle of July. It is doubtful if this system would prove profitable in any part of the county upon land which is in regular rotation, and that for two reasons—on the one hand, the land would not be sufficiently long in grass to compensate for the loss sustained by the want of the white crop; and on the other hand, if the soil had been previously well manured, there would be a great danger of the next white crop being "lodged" very much. This danger would be especially great in the higher districts, where the great

moisture which falls so encourages the growth of the straw, that lodging is no uncommon thing, even when the ordinary course of cropping is pursued.

So much for the first kind of grass land which is not broken up in rotation, namely, that which is either naturally dry or drained, and pastured throughout the whole season. There is another variety, commonly called meadow land, which is only partially drained, and off which hay is cut every autumn. It exists more or less in almost every district of the county, and the hay reaped off it is very valuable, especially to dairy farmers, who give it to their cows in spring. The reporter is of opinion that sufficient expense is not generally incurred in improving the condition of the meadow land. In too many instances, little or nothing is done to replace the strength which is annually taken from it, and it seems to be expected that it ought never to cease to shed its "grassy fleece." The incessant cry of its owner to it is "Give! give!" and bitter reflections are cast upon it if the fleece which it sheds happens to be a light one. However much it yields, it never seems to strike them that they ought to "give" it something in return. But while the above is too true of many whose farms are partly composed of meadow land, there are others whose treatment of it is much more liberal. As mentioned under the section on dairies, there are some who, having only a limited extent of green crop, put a portion of their farm-yard manure upon the meadows; but these constitute a very small fraction of the farmers in the county. Others apply occasionally a "compost" of earth and lime, which never fails to exert a most reviving influence upon the herbage; while a top-dressing with bones is sometimes tried with very good results. Abundance of good meadow hay is so important for use in spring, especially when given to dairy cows, that much more attention ought to be paid to the land on which it is produced than is done at present; for it appears to the reporter that this is one department of husbandry in which the Dumfriesshire farmer might make much advancement. September or early in October is generally regarded as the best season for top-dressing meadows, whatever be the material applied.

Section VII.—*Cattle.*

Dr Singer, in his "View of the Agriculture of Dumfriesshire," published in 1812, gives an estimate of the number of cattle which he supposed were in the county at that period. He estimates the number of all kinds at 30,000 head. His calculation was made in the following way:—He sets out on the supposition, which seems to have been generally granted, that there were about 12,000 milch cows within its bounds. He

remarks that it was general for breeders to keep two young beasts for every milch cow. Presuming this proportion to be general, the total number would be 36,000; but allowing for deficiencies in that proportion, he states them at 30,000. It is somewhat interesting to find that the same mode of calculation would give results almost exactly correct now. It appears from the Inland Revenue Returns, there were 15,861 cows in 1866. Supposing two young beasts for every cow, the number of young cattle would be 31,722, whereas there were in reality 28,503, the proportion of these two years of age and above being 11,230, and the number under two years of age 17,273. Thus the total, according to Dr Singer's method of computation, would be 47,583, whereas the real number was 44,364. If a similar allowance be made for deficiencies in the proportion to what he made, the result would be almost identical with what we know from statistics to be perfectly correct, thus showing how careful and accurate he must have been in his calculations.

The 44,364 cattle which were in the county in 1866 were mainly composed of animals belonging to the three following breeds, namely, Galloways, Ayrshires, and Shorthorns. There would be a few West Highlanders and some young Irish cattle, but these are comparatively few.

1. *Galloways.*—The "Galloways" were for a long series of years the almost universal breed of the county. Latterly, however, Ayrshires, as we shall see, have supplanted them to a considerable extent, until now there are not above one-half of the farms in the county on which Galloways exclusively are kept. A large number of the breeders keep their young cattle until they are two years old, when they are sold to the graziers and larger farmers. These are again sold in autumn, and the greater proportion of them which were not fattened in the county used to be sent to Norfolk. Of late years, however, this trade has been gradually diminishing, and at the present time many of them are sent to the Lothians and Fifeshire. We have adverted in a previous section to the stimulus which the growth of turnips, and the opening up of the county by steam communication, gave to the preparing of cattle for the fat market. The introduction of the dairy system to such a large extent also lessened the number of store Galloway cattle sent to the south. Before the practice of feeding cattle and keeping Ayrshire cows became so common, almost all the store cattle of the county were Galloways, and were driven by the road to Norfolk and adjacent districts. About thirty or forty years ago as many as 20,000 good cattle of this class were sent annually from the district of which the town of Dumfries is the centre. The most of the Galloways which are fattened in the county are despatched to the fat markets when from two years and nine months

until three years old. The heifers are generally ready first, and are disposed of at the former age. Many of the best of them are sent to the Smithfield market, and they usually sell at from sixpence to ninepence per stone more than the bullocks. This class are not commonly fat until they are three years of age, and they generally weigh about fifty stones. The heifers are in most instances from five to ten stones less in weight.

A very marked improvement has taken place in the quality of the Galloway stock of the county during the last twenty-five years. The means which have contributed to that improvement are for the most part similar to those which have been employed for the same purpose in other counties. But the most conspicuous and influential of these was an annual sale of young bulls which has taken place at Lockerbie since 1851, under the auspices of the Lockerbie Farmers' Club. Previous to that time many private sales of such animals were made at the annual show which was held there in April. It occurred to Mr Charles Stewart, that if a sale by auction were started it would afford great facilities for the interchange of blood between the Annandale, Cumberland, and Galloway breeders. This idea has been practically carried out since the above year, and unprecedentedly high prices were obtained. Most of the one-year-old animals disposed of realised from L.12 to L.20, while a few of the best gave from L.20 to L.30, and even some were sold for more than the last mentioned figure. Some years after a similar sale was started at Castle Douglas, and has been continued since with equally beneficial results. The following nobleman and gentlemen have long been distinguished for the superiority of their stocks of Galloway cattle:—The Duke of Buccleuch, Mr Graham of Shaw; Mr Gillespie, Annanbank; Mr Carruthers, Kirkhill; Mr Beattie, Newbie; Mr Roddick, Greenhill-head, and others.

2. *Ayrshires—The Dairy System.*—The dairy system is such a recent, and has become such a prominent, feature in the agriculture of Dumfriesshire, that the history of its gradual introduction into the county ought to form a leading part of such a report as the present. It was first introduced on the farm of Kirkbank, in the parish of Johnstone, which is on the property of Mr Hope Johnstone of Annandale. Dr Singer, whose work was published in 1812, records that Mr John Aitken (who was a native of Dalry, in Ayrshire, and who had originally come to the county for the purpose of making fences and roads) "introduced many years ago the Dunlop method of making cheese, and has continued to maintain a respectable character as a maker of superior cheese for many years. His cows are not of the Galloway breed, but of the horned and red and white speckled breed of Ayrshire." Mr Aitken died in 1812, and his successors con-

tinued the same system of management. Two brothers, Messrs W. & G. Jamieson, natives of Eaglesham, in Renfrewshire, entered upon a lease of the above farm in 1813. They brought a stock of Ayrshire cows with them from their native district. Being thoroughly acquainted with the process of cheese-making then most highly approved of, and being moreover most industrious men, they succeeded in making their farm very remunerative. Four years after, the younger of the brothers removed to Longhill, near Lockerbie, on the Castlemilk property, and carried the dairy system still farther into the county. It is probable that Ayrshire cows were kept about this time in the parishes of Kirkconnel and Sanquhar, which are quite contiguous to Ayrshire, but the reporter has been unable to ascertain the exact period at which they were introduced into that district. In 1823, Mr Hutchison had a dairy on the farm of Tinwald Parks, in the Dumfries district. In course of time the system was adopted on the farms of Lochbrow, Panlands, Dinwoodie Green, Castlemilktown, and others in Annandale, and on a few farms in various parishes of Upper Nithsdale. In 1832, the late Mr William Stewart came from Fenwick, in Ayrshire, and commenced a dairy on the farm of Hollybush, Cummertrees, and was the first, so far as we are aware, to introduce the system into the Annan district. Such was the extent of the inroad which the dairy system had made into the county at the commencement of the period over which this report extends.

Between 1840–50 several Ayrshire men became lessees of various farms at what were considered by local judges extremely high rents, but they succeeded beyond expectation, by pursuing the dairy system, which they were well able to do from their practical acquaintance with the best methods of cheese-making. Their success induced many native farmers to adopt the system; but in most instances, instead of keeping the cows in their own hands, they let them "abowing" to men who principally came from Ayrshire, and who had been trained from their earliest years to such work. In course of time cows were put upon comparatively high lands, which many practical farmers regarded as too high for such stock, and where only sheep and young cattle had hitherto been pastured. The writer of this report well remembers when, about 1853–54, dairies were introduced upon such high farms as Boreland and Gillesbie, in Dryfe, and Whitcastles and Cowburn, in Corrie (which are about 700 feet above sea level), surprise and disapproval were very freely expressed by men who are generally regarded as no mean authorities on most agricultural questions. But the leading position which the cheese produced at these dairies has frequently taken at local shows is an incontestable proof,—the force of which even the adverse critics above referred to are now ready

to admit,—that such land is at least as suitable for dairy purposes as any soil in the county. On high farms of this class the dairy farmer has not only the advantage of rich old pasture for his cows during summer, but, what is of equal importance, he has also a large quantity of superior meadow hay to give them during winter. He generally ploughs only as much land as will suffice to supply him with turnips for his cows. He thus requires only a portion of his farm-yard manure for that part of his farm which is under regular rotation, and as he generally puts the reminder on his meadow land, the hay reaped off it is both rich in quality and plentiful in quantity.

We have already adverted to the fact that the cows on many farms are let to dairymen, who may thus be said to "farm" the cows. This system prevails pretty extensively, although since an acquaintance with the process of cheese-making is becoming more general it is getting more common for farmers to manage their own dairies. There are, as in other counties, various methods of fixing the rent paid by dairymen, some preferring to take payment in kind—that is, they are paid so much weight of cheese per cow; while others are paid in money. There are two considerations which seem principally to weigh in leading dairy farmers to prefer the rent for their cows to be paid in kind. On the one hand, they regard it as the fairest plan for all parties, as it leaves them, as well as the dairymen, to take their chance of the price of cheese in the market; and on the other hand, they have the idea that their rent is more secure than when it is paid in money. Many of the dairymen have come only recently from Ayrshire and elsewhere, and being comparative strangers, their antecedents are not much known. It is perfectly possible that a dairyman might sell his cheese and run off with the proceeds, leaving the farmer minus his rent. It is due to the Bowers to say that this rarely, if ever, happens. But such a result is not only quite possible but even easy of accomplishment, and the farmer cannot be blamed if he guards against it, and makes himself secure by bargaining for a certain quantity of cheese, which is always upon the spot, and difficult of removal.

Dairies are seldom let for a longer period than one year, and the dairyman generally gets possession of the cows at Martinmas. This term is found most convenient for exchanging any of the cows in the dairy, such as replacing old cows and others (which may be found unsuitable from any cause for dairy purposes) by the young queys, and putting the former into the stalls to be fed. The allowance of pasture for each cow varies in accordance with the quality of the soil. It is found to be of great advantage to have a portion of the land assigned to the cows in permanent pasture, and well top-dressed with lime or bones. Such pasture is of great use in the end of June or July, when

the younger grass on land which is under regular rotation generally becomes very bare. About one imperial acre of growing turnips is allowed for every ten cows from about the 1st October until the 1st January, at the latter of which periods the cows generally become dry. About November, turnips, at the rate of about one ton per cow, are stored for spring consumption. These with the addition of from six to ten stones of bean-meal, or an equivalent of oats, which are given in a mashed condition, are allowed to the cows from about the 20th March, when they begin to calve, until they are turned out to the grass about the 15th May. Sometimes half an acre of potatoes is allowed to the dairyman for the use of his family, and to enable him to fatten his pigs. We may here explain also, that the dairyman generally fattens one pig for every two cows. The most of these, as explained in the section on pork feeding, are sold to be consumed as fresh pork in the summer and autumn, and the remainder are disposed of for curing purposes in November and December.

As remarked above, the dairymen sometimes pay their rent in kind—that is, they pay to the farmer so much weight of cheese per cow; indeed, this is the most common plan. The amount of money paid per cow varies in the same dairies from year to year, according as the price of cheese fluctuates in the market; and the rent, whether paid in money or cheese, varies on different dairies according to the extent and the quality of the pasture and the quantity of turnips and artificial food allowed. From L.9 to L.11 may be quoted as an average amount when the rent is in money, while from 3 cwt. to 3½ cwt. is a common quantity when the payment is in kind. Three-fifths of the cheese rent is generally weighed and handed over to the owner of the cows about the beginning of October, and the remaining two-fifths is handed over at Martinmas. It is generally made a condition of the dairyman's lease that he rears one quey calf for every six cows. These calves have new milk given them until they are eight weeks old, when they are fed upon whey for another month, and then delivered to the farmer, who rears them to replace the old cows which are periodically taken from the dairy. The plentifulness of turnips in Dumfriesshire induces most dairy farmers to prepare their old cows for the fat market. In only a very few instances are they sold as "back-calvers," as is commonly the case in Ayrshire.

The "Dunlop" system of cheese-making was universally pursued in the dairies in the county until about six years ago, when the "Cheddar" system began to be adopted, and grew gradually into favour, until now it is practised in at least three-fourths of the dairies.

Cheese is made from the time the cows are put upon the

pastures in May until about the 1st November. During the winter months skim-milk cheese and butter are made. The extremely high rate at which milk can be sold in Glasgow during the months of January, February, and March, and the great facilities afforded by the Caledonian Railway Company for its transmission, have induced many to send thither large quantities of milk at that period. It is highly important, in a philanthropic point of view, that large quantities of milk should be sent into such populous towns as Glasgow. A serious obstacle to its transmission "all the year round" is, that from its perishable nature it is apt to become useless while being conveyed during the hot weather. We will be surprised, however, if, in this inventive age, means are not devised to overcome the difficulty. The calves are sold when a day or two old, and realise from 6s. to 7s. each. Some dairymen, however, prefer to fatten their calves, the earlier calved ones, after being kept for six or seven weeks, bringing from L.2 10s. to L.3 each. The later ones cannot be kept so long, and do not command such a large price, as the calves are always cleared out before cheese-making is commenced at the middle of May. Some farmers who manage their own dairies put a Shorthorn bull to their cows, and rear the calves as store cattle.

The agricultural statistics have never been collected in such a form as to determine how many Ayrshires were in the county at any particular period. Their number, in comparison with the other breeds, is therefore a matter of conjecture. Five and twenty years ago, Galloways were the universal breed, with the exception of the Ayreshire cows in a few dairies, and a few Shorthorns close upon the Border. Now every arable farmer, almost without exception, in at least four or five of the parishes of upper Nithsdale, has a dairy, and the system prevails more or less in the whole of that dale, while Ayrshire cows are kept on many of the farms in every part of middle and upper Annandale. The increase of Ayrshires in point of numbers, and how the *fashion* has set in in their favour, may be inferred from the fact that, whereas, at the time we specify, it was never dreamt of to offer a prize for them at a local show, now an equal number of prizes are given for them at almost all local shows as for any other breed of cattle, and the attention of the public is divided between the prize-takers belonging to the two breeds. A further idea of the extent of that increase may be gathered from the fact, that whereas there were only 14,025 milch cows in the county in 1855, there were, as we have seen, 15,861 in 1866, showing an increase in eleven years of 1836, or fully one-eighth. Even more than the above number of Ayrshires would be added in that time, for the Galloways are diminishing almost as much as the Ayrshires are increasing.

Were the writer disposed to give way to sentiment, he might give expression to a sad lament that the substantial beef-producing Galloways should be supplanted to so large an extent by the less familiar and less imposing Ayrshires; but as his present duty is to act as a "reporter," he rests contented with simply recording the changed state of things. Besides, it cannot be reasonably expected that farming should be much influenced by *sentimental* considerations. The object of the farmer is professedly to obtain the largest return he can secure for his land, and therefore the first and most natural question for him is, what *pays* best? If observation or experience teaches him that Ayrshires yield a larger return than Galloways, a mere feeling of attachment to a particular breed of cattle cannot be expected to induce him to hesitate in effecting a change, seeing his main object is one of profit. It will be evident that we are here speaking of the tenant farmer who is making his livelihood from agriculture, and not of the person who has come in some way or other into the possession of money, and who takes to farming as a mere agreeable pastime, and with whom profit is a mere secondary consideration. The latter may be left to follow his fancies without raising the question whether or not these prove profitable, whereas with the former profit is everything.

It is a fair question for debate, whether in such a county as Dumfriesshire, Ayrshires or Galloways are the more profitable, and the reporter believes that, although the tide of public sentiment has set in in favour of the former breed, yet many of those in the county who are usually looked to and followed as high authorities on agricultural questions would be found to rank themselves on the side of the Galloways. The county is so diversified in respect of both soil and climate that no monotonous rule can be laid down which should be universally followed. This diversity is not only found in different districts, but in different parts of the same district. In fact, farms are often found alongside of each other which in their natural characteristics have very little in common. Some are therefore adapted for dairies, while others are not.

3. *Shorthorn and other Breeds.*—In addition to Galloways and Ayrshires, there are a few cattle of the Shorthorn breed kept within the county. The greater number of these are kept on the heavy land adjoining the Border, though there are isolated farms in other parts of the county on which they are reared. The quality of the animals of this breed is on the whole pretty good. Mr Carruthers of Dormont had for some years an annual sale of first-class Shorthorns, which did much to diffuse pure blood throughout the county. The number of pure-bred Shorthorns is very limited. It is found that the Ayrshires milk better than they do; and when a Shorthorn bull is put to the

Ayrshire cow, a cross-bred animal is produced which, though not so heavy as, is yet much easier reared than a pure Shorthorn.

The West Highland cattle brought into the county have by degrees been becoming less numerous. This is doubtless owing in some degree to the fact that the inbuying price is higher than formerly, and therefore they do not leave such a large profit as they used to do. Another explanation probably is, that the ground they used to feed upon has of late been occupied by sheep and dairy cattle.

A few Irish cattle are being imported, and have in many instances been found to pay well. They can be bought at comparatively little money; and although they have a pining look for some time, yet they are not long upon the good pasture until they begin to improve rapidly.

It is becoming fashionable for county gentlemen to keep a few Shetlanders, which they kill for the supply of their own households. These have the double recommendation for private use, of yielding beef of the finest quality and of a limited quantity, their ordinary weight when fat being from twenty to twenty-five stones.

With regard to the rearing of young store cattle generally, it may be remarked that they are much better kept at every stage of their growth than used to be the case. Many breeders are in the habit of giving them a liberal allowance of turnips along with their fodder.

Very little remains to be said as to the feeding of cattle for the fat market. Stall feeding is more generally practised than the open shed system, though the latter does prevail to some extent. Oilcake, mashed oats, and other feeding stuffs, are given in different quantities by different individuals. Only a limited number of cattle are sent direct from the pastures to the fat market. A few of the cattle are sent to the Smithfield market, but the greater number used to be forwarded to Liverpool. Latterly, auction marts for the sale of fat cattle have been established in Dumfries and Lockerbie, and many of the animals are consigned to the auctioneers in these places. Butchers and dealers from the populous towns in the north of England often purchase largely at these sales. Christmas fat shows have been held for several years, at which many first-class animals are exhibited and disposed of.

Section VIII.—*Pork Feeding.*

Pork feeding has been carried on to a large extent in Dumfriesshire, so much so indeed that the county has earned a wide reputation alike for the quantity and the quality of the bacon which it produces. There are no more common labels in the

windows of provision shops in Glasgow and several other large towns than those with "Dumfriesshire Hams," "Dumfriesshire Bacon," upon them. A pretty accurate estimate of the quantity produced in the different counties of Scotland may be formed from the agricultural statistics collected by the Inland Revenue. It seems there were the large number of 18,612 pigs within the county on the 5th March 1866, being nearly 1000 more than in any other county in Scotland, the next largest being Perth, which had 17,782 within its bounds. In estimating the quantity produced annually in Dumfriesshire, there must be added to the above upwards of 4000 which are pigged between the beginning of March and the middle of June, and fattened before the succeeding March. Thus the number of pigs fattened in the county, in the average of seasons, may be correctly enough reckoned at about 22,000 head, which, if computed at fourteen stones each and valued at 6s. 6d. per stone, would yield a little over L.100,000. The reporter has compared the foregoing calculation with the annual estimate, founded on a summation of the quantity sold weekly during the curing season in the different markets, which the "Dumfries Courier" has made of the pork trade of the county for a series of years, and has found that the agreement between them is pretty close. Dr Singer estimated the number fed in Dumfriesshire in 1812 at 13,000, and he reckoned the annual return from this source over the whole county as amounting to about L.60,000.

A trade in *fresh* pork has arisen in Dumfriesshire almost entirely within the last eight or ten years. There has never been much demand for fresh pork for consumption in the county, and therefore pigs were seldom brought to maturity except during the winter months, when they could be cured and forwarded in a dry state to the large towns. But since the Caledonian and the Glasgow & South-Western Railways traversed the county, and opened up a cheap and speedy transit to the populous mining and manufacturing towns in the north of England, the demand has created the supply, and large numbers of live pigs, varying in weight from seven to fifteen stones each, the greater number being nine and ten stones, are now forwarded every summer to Newcastle, Liverpool, Manchester, Preston, and elsewhere. These are principally from the dairies, and they are mainly fed on the whey, which proves itself most nutritious and fattening. But while it is true that the pigs which are sold during summer as fresh pork are principally from the dairies, it ought also to be mentioned that not a few of them are animals fed by cottars, especially in middle and upper Annandale. It appears to the reporter that the opening of the trade in fresh pork is highly beneficial to this class. The fact that they can dispose of their pigs during summer as well as in winter acts as an inducement

for them to make the most of their vegetables, and to be careful in their management at all seasons.

There has been comparatively little variation in the quantity of pork produced in Dumfriesshire during the last twenty-five years. About the same number of pigs would be fed in 1842 as now, but they were then kept to a greater age, and fed until they reached a heavier weight than at present. At the former period every farmer kept a considerable proportion of his pigs until they were fourteen or fifteen months old. Now, very few are more than one year old when they are killed, and the great proportion are taken to market when nine and ten months old; consequently the average weight is much less now than formerly. Eighteen to twenty stones of 14 lbs. used to be a very common weight; now they generally run from fourteen to sixteen stones. This difference in weight is owing in some degree to a change in the breed, as well as to their age, a kind of smaller bone and finer quality having come now into fashion. The curers express a decided preference for the lighter class of carcasses, and this induces the feeders to rear the smaller kind.

So much for the relative quantity produced in the county at the commencement and close of the period over which this report extends. It may not be uninteresting to inquire further what proportion of pigs are fed in Dumfriesshire in comparison with other counties. A perfectly accurate estimate of this may be formed from the agricultural statistics collected by the Inland Revenue. The quotations we make are from the Report of 1866. As remarked above, there are nearly 1000 more pigs in Dumfriesshire than in any other county in Scotland. Dumfries has 18,612; Perth has 17,782; Forfar, 14,868; Aberdeen, 14,763; Fife, 14,193; Ayr, 13,502; and Kirkcudbright, 10,289. There are several counties, however, which have more pigs, in proportion to the number of cattle kept, than this county; whereas, for example, Dumfries has 2·38 cattle for every pig, Haddington has only 1·26; Edinburgh, 1·35; Berwick, 1·82; Fife, 1·92, and Forfar, 1·92.

The question may be asked, How is the fact to be accounted for that the aggregate quantity of the pork fed in the county is so great? We believe that one main cause is to be found in the large quantities of potatoes which used to be grown in the county before the failure in that root took place. The expense of conveying these to the populous districts was so great, that, as Dr Singer mentions, the price of potatoes was usually double in Edinburgh what they could be sold for in Dumfriesshire, and he specifies 1s. 3d. per cwt. as an average price. Hence it was found more profitable to feed pigs with them, and thus convert them into a more portable form. A coarse variety, which yielded a very large return per acre, used to be cultivated for the ex-

press purpose of pig-feeding. This explains the large number of pigs which were fed in the county previous to the potato failure. For a few years after this calamity took place the number of pigs kept slightly decreased; but farmers gradually got into the habit of giving them turnips in place of potatoes, until, as we have seen, the quantity of pork produced in the county is now as great as ever it was. Another reason is that, especially among the smaller class of farmers, the pigs are found to be a most convenient as well as profitable means of consuming the smaller produce of the farm. They thus serve as a sort of "savings' bank" to them. We say "especially among the smaller class of farmers," because many more pigs are kept by such farmers, in proportion to the extent of land in their possession, than by farmers whose holdings are larger. Employment is also given to the members of the family, who are thereby kept at home.

Section IX.—*Sheep.*

The sheep grazed in the county may be divided into two classes—1st, Those kept for breeding purposes; and 2d, the ones which are fed for the fat market. Before estimating the number in each class, we shall give a brief account of the various breeds, and of the parts of the county in which each is kept.

The sheep kept for breeding purposes are composed mainly of the Cheviot and Black-faced breeds. There are also a few ewes of the pure Leicester breed, but they are not numerous. From the Cheviot ewes two different kinds of lambs are bred. The ewes on the hill pastures strictly so called, which measure 498,364 imperial acres, have invariably rams of their own breed put to them. But there are a large number of Cheviot ewes pastured on the arable lands, and on the permanent grass lands, which are situated at an intermediate altitude between the higher hill pastures and the cultivated land, and from these cross-bred lambs (Cheviot and Leicester) are produced. This crossing of the Cheviot ewe with the improved Leicester ram has within the last forty years been carried to a great extent, and has much enhanced the value of the Cheviot breed. The mothers being hardier than the Leicester ewe, are better nurses, and their progeny produces as heavy and finer mutton than the pure Leicesters. The lambs, after being weaned in the beginning of August, are kept upon good grass until October or November, when they are put upon turnips, and fed off in the manner described under the section on green cropping.

To give the reader some idea of the situation of the farms on which the Cheviot stock is kept, as well as the character of the herbage and the general management pursued, we cannot do better than quote some extracts from a concise and valuable

paper, which was drawn up before the Paris Exhibition in 1856, with the view of affording to those unacquainted with Scotch farming information regarding the Cheviot breed of sheep :—

"The farms extend from 700 to 800 acres up to 6000 or 7000, the most common size being about 2000. But in many cases one farmer holds several of these farms, though detached from each other and his residence. The increase of capital and skill, and facility of intercourse, have created a tendency of late particularly to accumulation. The height varies from 500 feet above sea-level to nearly 3000, which the hills attain on the northern boundary of Dumfriesshire, being the most inland point. In general a very small portion of the farm is cultivated, rarely exceeding 50 to 100 acres, and often none. At 800 to 1000 feet above sea-level, in the inland county, rain falls more than half the days of the year. The rain-gauge shows 48 inches of rain during the year; the mean annual temperature about 44° (Fahrenheit), that of the season from 1st May to 1st October being about 53°.

"The natural herbage varies much in quality and quantity. On some farms heath preponderates, and the grass for food among it is scanty; on others a green sward of fine or coarse herbage covers the hills; and on the lower slopes, on damp clay subsoils, there is a coarser green growth, which affords much sustenance, particularly in winter and spring, when the finer summer grasses fail. A mixture of the various soils and grasses is conducive to health.

"On the majority of farms the sheep remain on the farm, going at large during the whole year, each sheep keeping within a range of a mile or little more. In a few high-situated farms (not above a tenth in number) the flocks occasionally, in deep frozen snows in winter, have to be removed for a few weeks to lower situated farms, where there is little snow; but this happens only once in several years. On many farms subject to such snows, hay is cut from the grounds sufficient to serve the flock some weeks. It is the practice on some, but not many, farms to keep a part or the whole of the one-year-old sheep on turnips or grass on the lower grounds during winter, and occasionally the weak of all ages. Loss by diseases and hunger occurs on all farms, varying from 2 to 10 or 12 per cent. on the whole stock—averaging, exclusive of lambs when suckling, about 5 per cent. The loss of lambs is also about 5 per cent., excepting in bad seasons, when it will reach 10 per cent.

"The ewes have their first lambs in April, when two years old. They are kept to either five or six years old, then sold, and replaced by the best of the ewe lambs."

The quality of the pure Cheviots of Dumfriesshire is not surpassed anywhere in Britain. Great care and attention have

been bestowed upon them by individual flockmasters, with a view of improving the breed, and the most gratifying success has attended their efforts. Mr James Brydon, formerly in Moodlaw, has earned a reputation as a breeder of Cheviots second to no breeder of any class of stock in any part of the kingdom. The following gentlemen have of late frequently been distinguished at national and local shows for the purity and superiority of their animals belonging to this breed, viz., Messrs Borthwick, Hopsrigg; Carruthers, Kirkhill; Johnstone, Capplegill. All these gentlemen have had biennial sales (by auction) of rams, at Beattock, Langholm, and other central and accessible localities, at which extremely high prices have been obtained for many animals, and the average of the whole exposed has always been very high. These have been dispersed not only throughout the higher parts of Dumfriesshire, but also over all parts of Scotland where Cheviot sheep are kept, and they have been the means of effecting a marked improvement in the quality of this valuable breed of sheep.

The hill pastures of Dumfriesshire, on which Cheviot and Blackfaced sheep are grazed, are stocked, on an average, at the rate of one ewe for a little less than two imperial acres. The pecuniary return from a Cheviot ewe varies from year to year as the price of lambs and wool fluctuates in the market. The progeny are not kept until they are three years old, as is done in the Highlands, but are sold when lambs. The annual sale of lambs in August runs from 450 to 500 for every 1000 ewes kept, of which three-fourths are wedder lambs, and the remainder small ewe lambs. From 130 to 150 old ewes are also sold each year, the number of ewes and lambs varying according to the healthiness of the farm and the season. These sales, with the price of the wool varying from 3 to 3½ lbs. (washed) for each sheep, constitute the whole revenue derived from the Cheviot sheep-farm.

Almost all the Cheviot ewes that are kept on the arable farms, are the draft five and six year-old ewes from the hill stocks. They are brought to the low lands about the beginning of October; and half-bred lambs (Cheviot and Leicester) having been reared from them, they are fattened upon grass and turnips, and generally sold before the Christmas of the following year.

Blackfaced sheep are also kept to some extent on some of the mountain pastures of Dumfriesshire. Indeed, during the earlier part of last century, this hardy breed was almost the only kind of sheep kept on the higher sheep-walks. But in the end of last century, the Cheviot breed had spread over the eastern portion of Dumfriesshire, supplanting the Blackfaced on the hills in this as in other counties. The extent of the encroachments which the Cheviots had made in 1812 on the walks of the Blackfaced is definitely recorded by Dr Singer, who says that

"at the present time it is believed that all Eskdale is under Cheviot stocks, and also by far the most part of Annandale, up to the marches of the county, including the vales of Evan and Moffat. They are not yet so numerous in the upper part of Nithsdale, where short sheep still prevail." Though there have been pauses in the progress, when from bad seasons the farmers were deterred from changing, yet it may be said on the whole that it has been regular and steady. The Blackfaced, however, still hold their own on some hills, especially on the more rugged and heathy in Nithsdale. About one-sixth of the hill stocks are Blackfaced sheep, the remaining five-sixths being Cheviots. In some cases pure Blackfaced lambs are bred, while in other instances Crosses (Blackfaced and Leicester) are produced.

The farmers who breed Leicester and other long-wooled sheep are not numerous. The quality of many of the stocks, however, is very good, as has often been proved at the Highland Society's and other shows. Messrs Wilkin, Tinwald Downs, and Hamilton, Torthorwald, have long bred first-rate animals of this class; while more recently they have had formidable competitors in Messrs Smith, Dalfibble; Bell Irvine, of Whitehill; and Beattie, Newbie.

In forming an estimate of the number of sheep in Dumfriesshire, much depends on the time of the year at which the estimate is made. The statistics have been always collected at an unfavourable season for affording satisfactory information on this point. When collected through the Highland Society and the late Mr Hall Maxwell, the enumerators made their inquiries on one occasion on the 1st of June, and another on the 1st of July; but it will be evident to most readers that there are usually more sheep in the county at that particular season than at any other. Many of the old feeding sheep are not cleared out to make room for the lambs; and, moreover, many of the latter are taken out of the bounds of the county altogether in August and September. Again, the statistics collected through the Inland Revenue were gathered on the 5th of March, when there were almost no lambs at all. This explanation regarding the dates at which the inquiries were made, accounts for the vast difference in numbers between the returns of 1856 and 1866. The Highland Society return of 1856 gave 243,783 sheep of all ages for breeding, 38,666 sheep of all ages for feeding, and 186,023 lambs; the total number of sheep of all ages being thus 468,472. The return of the Inland Revenue, made on the 5th March 1866, was as follows :—One year old and above, 243,758; under one year old, 127,728; the total at that date being only 371,486. It appears to the reporter that the period at which the estimate should be made is the 1st of November, for the stocks both on the high and the low lands are generally adjusted at that season as they are

meant to stand for the winter. The following estimate, as at the above date, has been made after consulting some of the most competent authorities in the county:—

1. Cheviot and Blackfaced stock on the hill pastures, ...	220,000	to	230,000
2. Cheviot ewes on intermediate pastures and low lands from which half-bred lambs are reared, ...	60,000	to	70,000
3. Sheep of various breeds in the low lands, and principally wintered on turnips, . .	100,000	to	110,000
Making, of all kinds in the county, a total of	380,000	to	410,000

The 220,000 to 230,000 sheep which are supposed to be kept on the hill pastures are meant to include not only ewes, but also young sheep which are being reared for breeders.

Dr Singer estimates the total number of sheep in the county, at the time he wrote, at 200,000, of which he supposed 175,000 belonged to the mountain flocks, and the other 25,000 to the low farms. It will thus be seen that the principal increase has taken place on the low lands; and it is not too much to say that the introduction and improvement of cross-bred sheep has largely benefited the arable farmer, in the profitable consumption of his root crops and sown grasses, so necessary to keep up the fertility of his lands.

SECTION X.—1. *Draining.* 2. *Liming.* 3. *Subsoil Ploughing.* 4. *Comparative Expense of working an Arable Farm twenty-five years ago and now.* 5. *Auction-Marts. Concluding Remarks.*

We come now to treat shortly of several miscellaneous topics, some of which have indirectly been referred to in previous sections, but they are of such importance as to require separate notice, and the first is—

1. *Drainage.*—The extent to which drainage has been executed in Dumfriesshire has been indicated in the second section, and need not be repeated here. It began to be extensively carried out immediately after 1840, until now about one-half of the land in the county which required it has been drained. The L.71,000 of the Government grant which was appropriated in Dumfriesshire, was carefully and profitably spent, under the able superintendence of the late Mr James W. Patterson, who acted as inspector. The soils and subsoils are so different that the drains are cut at various depths and distances apart. Many used stones to carry off the water, when drainage first became

extensive, but latterly tiles have been all but universally employed. It may be said generally, that about as much yet requires draining as has been drained. A considerable extent of permanent pasture land in the county admits of extensive improvement by means of tile draining. With the exception of the estate of Corrie, to which more particular reference will subsequently be made, comparatively little of this class of land has been satisfactorily dried. Open drains have been cut in many parts, but few covered ones have been made. L.7 per imperial acre is about the average cost of drainage, at the depths and distances apart which are necessary in Dumfriesshire.

2. *Liming.*—Liming has been very extensively carried out in Dumfriesshire, especially of late years, on permanent pasture lands. Previous to the opening of the Caledonian and Glasgow and South-Western Railways, many parts of the county were situated at such long distances from the lime-works that the cartage cost more than the original price of the lime itself. It was, therefore, sparingly applied in these districts. Now, however, that it can be had so reasonably at the various railway stations, it is being extensively applied to both cropping and pasture land. The quantity given per acre varies according to the character of the soil, and the purpose for which the land is to be subsequently employed. On land under regular rotation, from 20 to 50 Carlisle bushels are given, the general quantity being from 30 to 40. (A Carlisle bushel is equal to 3 imperial bushels.) On permanent pasture land about 50 or 60 bushels are an ordinary allowance, while some apply as much as over 100 Carlisle bushels. Practical men are beginning to be convinced that it is highly profitable to give a liberal allowance of lime to permanent pasture land, situated at an intermediate altitude between the high hill pastures and the low arable farms, and the reporter feels assured that much improvement will be wrought in this way in coming years. There are several extensive lime-works in the county—at Kelhead (Cummertrees), Closeburn, Barjarg, and other places—but part of the lime which is used is brought from Cumberland.

Before passing from this subject, the reporter proposes to give a short account of the improvements in draining and liming, which have recently been carried out on an extensive scale on the estate of Corrie, the property of Andrew Jardine, Esq. of Lanrick Castle. Mr Jardine became the proprietor of the Barony of Corrie at Whitsunday 1853. The leases of most of the farms expired in the following year. New leases were granted for a period of nineteen years, on the express condition that extensive improvements were to be carried out in the draining and liming of pasture lands. The proposals which were made on the part of Mr Jardine proved acceptable to

the tenants, who went to work with great energy and good-will.

A bed of clay of very moderate depth was discovered at Corrie Common, but of sufficient extent to warrant the proprietor erecting a tile kiln and drying sheds. At this place, which is a very central one for the property, and 680 feet above sea-level, all the tiles that have been used in draining operations since 1854 have been manufactured.

The general agreement entered into between landlord and tenant was as follows :—That three years' rents of the farms were to be expended by the proprietor in tile draining during the first four or five years of the leases, and that the tenants were to cart the tiles free of charge, and pay 5 per cent. on the whole outlay. Draining has been executed at various depths and distances, from 3 feet deep and 18 feet apart to 3½ feet deep and 24 feet apart, and in a few cases to 4 feet deep and 30 feet apart. We believe the most satisfactory results have been obtained when the drains have been made 3 feet deep and 18 feet apart. And here it may be necessary to explain that the soil of the pasture land of Corrie is of a strong, deep, retentive character. The drains are very easily cut for the first two spadings, but the soil is very stiff and tenacious farther down.

The rates per rood have varied according to the character of the soil and subsoil, but the average rate for cutting and filling three-feet drains, including generally main drains, has been, we understand, about 8d per rood. At 18 feet apart, there are 134½ roods in a statute acre, and

134½ roods at 8d per rood, ...	£4	9	8
2133 tiles, 13 inches long, will be required for an acre, and these at 19s. per thousand,	2	0	6
Laying tiles, occasional extra cutting, and large tiles for main drains, may be stated at	0	9	10
Thus the cost per statute acre has been about	£7	0	0

About four millions of tiles have, we believe, been manufactured on the estate since 1854, and the extent of land drained has been about 1700 acres.

So much for drainage. As regards liming, the general rule was for the proprietor to allow one year's rent for lime to be applied in the first instance to drained meadow or pasture land, and secondly, to dry pasture land lying adjacent to or interspersed among tile-drained land. The tenants were bound to lay out also one year's rent, and to cart the whole quantity at their own cost, either from the neighbouring lime kilns or from the Caledonian Railway station at Lockerbie. It was stipulated that the lime was all to be applied in the course of the first five or six

years of the lease. There are several small holdings in Corrie of less annual rent than L.12. In these cases the proprietor has always furnished the lime himself, and charged the tenants the moderate rate of interest of 5 per cent.

The application of lime has varied in quantity, but the average quantity applied has been, we believe, about 75 Carlisle bushels per acre. This is equal to 225 imperial bushels, or about $9\frac{3}{8}$ tons. The price of lime at Blackwoodridge has been 11d. per bushel for many years, and the cartage, when let, would cost the tenants about 8d. Thus the price of the lime, when laid on the land, would be 1s. 7d. per bushel, or L.5, 18s. 9d. per acre, wherever 75 Carlisle bushels have been applied. Part of the lime put upon the farms on the Corrie estate was brought from Cumberland by railway to Lockerbie, and carted the remainder of the distance. This lime has varied in price, but, including cartage, it has cost about L.6, 12s. 10d. per acre, when 75 bushels were applied, which is 13s. 11d. per acre more than the lime from Blackwoodridge. Mr Jardine does not allow any part of the price of lime applied to arable land.

Exclusive of lime supplied to tenants of small possessions, the quantity applied to meadow and pasture land during the current leases, the most of which, as remarked above, are dated from Whitsunday 1854, has been about 102,000 Carlisle bushels, or at 8 Carlisle bushels to the ton, 12,750 tons. This, at $9\frac{3}{8}$ tons per acre, would lime about 1400 acres of land.

The improvements on this estate, the rental of which we may remark is entered in the Valuation Roll at about L.4000, have not been confined to draining and liming. The dwelling-houses and farm-steadings have been greatly renovated and extended, and this has been done in such a way as to give the tenants the accommodation necessary for the proper carrying on of their various modes of management. No interest is charged on buildings, the only exception being hay barns, to which reference is made in the section on grain crops. Plantations have been laid out of considerable extent, and these have chiefly been enclosed by stone walls affording immediate shelter. Water courses have also been improved, and occupation roads made and repaired.

The reporter leaves the above facts, for the correctness of which he can vouch, to speak for themselves. They speak volumes regarding the enlightened liberality of the landlord, who is well represented in the person of his intelligent and active factor, Mr Andrew Glover. The best proof that this "high farming" is satisfactory in a financial point of view, is furnished by the fact that the allowances of lime covenanted for in the leases have in almost all cases been exceeded, and that the applications made for further grants have in no instance been refused by the pro-

prietor. This shows at least that both landlord and tenant believe such liberal treatment of the land to be remunerative. In judging of the advisability of applying such a large quantity of lime per acre, it ought to be borne in mind that the climate is very moist, about fifty inches being the rainfall in an ordinary season.

3. *Subsoil Ploughing.*—Subsoil ploughing was practised to some extent on some of the larger farms in the county from twenty to twenty-five years ago. It is now unknown. This has arisen from many causes. One is, that it was found to serve a good end only when the subsoil was kindly. Another is, the very great expense which it costs; and the shortening of the leases to fifteen years does not give the tenant a reasonable prospect of being repaid for that expense during the currency of his lease. A further reason for the limited extent to which it has been carried is, that it cannot be properly executed unless on the larger class of farms where at least six horses are kept.

4. *Comparative Expense of working an Arable Farm twenty-five years ago and now.*—We adverted in an early part of this paper to the greater productiveness of the soil of the county now than at any former period, as evidenced in the increased valuation of the lands within its bounds. This increased productiveness must be all the greater, from the fact that the expense of cultivating it is, principally on account of the rise of wages which has taken place, very much augmented. This will be the more apparent from a comparison of the wages which were paid in 1842 and those that are current now.

	1842.	1867.
Ploughman's half-yearly wage, with victuals,	£5 10 0 to £6 ...	£9 9 0 to £10 10 0
Man's wage during harvest, with victuals,	2 2 0	4 0 0 ... ...
Labourer's wage per day, without victuals,	0 1 9	0 2 6 ... ...
Woman's half-yearly wage, with victuals,	2 10 0 to 2 15 0	5 5 0 to 5 10 0
Woman's wage during harvest, with victuals,	1 10 0	2 2 0 ... ...
Woman's wage per day, without victuals,	0 0 9	0 1 0 to 0 1 2

Not only is the expense of working an arable farm increased in proportion to the rise of wages which appears from the above table, but it ought also to be borne in mind that, especially at certain seasons of the year, more labour is actually spent now than was necessary under the management pursued then. For example, before turnips were grown so extensively, and even at

a later period, before so many of them were stored in the field for consumption by sheep, there was comparatively little outside work for women after the time when the potatoes were lifted. Now, however, all persons capable of shawing turnips are almost as constantly employed, when the weather permits, during the last two months of the year as at any other season, thereby entailing a largely increased expenditure upon the farmer. Thus the increase in the productiveness of the soil is much greater than appears from the rise in rents which has taken place, for the farmers have not only this increased rent to provide against, but also a heavier manure account to pay than formerly, in addition to nearly one-half more in servants' wages than twenty-five years ago.

5. *Auction-Marts.* — The introduction of auction-marts has changed the methods of effecting sales in the south of Scotland as elsewhere. Three marts have been established in Dumfries for several years, all of them in buildings erected for the purpose, and one in Lockerbie. At every one of these an immense number of animals fit for the fat market, and store cattle and sheep, are weekly exposed for sale. The system has been gradually growing in favour, and bids fair to revolutionise the old methods of disposing of stock. Before their introduction, all the fat stock fed in the county, except what was bought for home consumption, was consigned to salesmen in Liverpool and elsewhere. Now, the greater number of the animals are sold in these marts, and they are principally bought by butchers from the populous towns in the north of England, only a small proportion of what used to be sent to Liverpool now finding its way to that market. In addition to their other advantages, the auction-marts have this recommendation, that the feeder can dispose of any, even the smallest number of cattle or sheep at them; whereas, under the former system, unless he had a large number to dispose of, he required to combine with one or more of his neighbours before he could send his stock to Liverpool at a reasonable expense.

Our remarks under the different sections have extended to such a length that little remains to be said. Great as is the progress which the agriculturists of Dumfriesshire have made, much yet remains to be accomplished. The writer would be trespassing beyond his legitimate province were he to speculate as to what should be done in the future, his task being confined to "reporting" on the past. He has every confidence, from his intimate knowledge of the tenant-farmers of the county, that they will continue, as heretofore, to be industrious and enterprising.

REPORT ON THE AGRICULTURE OF DUMFRIESSHIRE.

By H. Newby Fraser, Wyseby Hill, Ecclefechan.

[*Premium—Silver Medal.*]

The county of Dumfries ranks as the seventh in extent in Scotland, containing an area of 722,813 acres, or 1129 square miles. It extends fifty-five miles from east to west, and thirty-two from north to south; and the population at the last census in 1861 was 75,878, allowing almost ten acres for each inhabitant. The county valuation in 1791 was L.117,621; in 1841, L.272,217; while at present it stands at L.389,561, having thus more than trebled its value in about seventy-five years, a fact which in itself speaks volumes for the improvement which must have taken place in the land, it being, in the strictest sense of the word, a purely agricultural county. The towns are small, and manufacturing only carried on to a limited extent in two of them. So far as regards situation, its advantages are great for the conveyance of stock, grain, or other agricultural productions, either north or south; the Caledonian line of railway running through the centre of the county, the Glasgow and South-Western along the west up to the extreme north; while the Solway Frith, which bounds it partially on the south and west, allows of goods being shipped, principally to Liverpool, from various points on its coast, the chief being Dumfries and Annan. The climate is moist and humid, the rainfall being about the greatest of any county along the west coast, and the rains off the Solway are often exceedingly heavy. The frosts, however, are not so severe as along the east coast of Scotland, nor does the snow, except on the high and cold districts, ever lie long, or to a great depth, which is to be regretted, for most farmers think the winters are too mild. If there were more frost and snow, the land under cultivation would be greatly benefited, both by making it looser and destroying grubs and insects. The county may be said to be divided into three straths or dales, viz., Annandale, Nithsdale, and Eskdale; the two former running almost north and south, and the latter east and west. Through these straths, from which they take their names, flow the Annan, the Nith, and the Esk—three fine rivers, vieing with each other in the beauty and variety of the scenery through which they pass. The most extensive and richest of these districts is the first named, many of the holms along the banks of the Annan being unsurpassed either for grazing or cropping by any land in Scotland, while the high ranges carry Cheviot sheep of great excellence. The soil of Annandale is heavier and stronger than Nithsdale or Eskdale, that of the latter being generally what is termed sharp—that is, dry and porous, with a subsoil of gravel. Probably the soundest

land in the county, and certainly the finest quality, is found along the slopes of the Tinwald hills, in the parish of the same name, facing the south-west, on which grain of the best quality is grown, while for green crop it is unsurpassed. In the lower districts of Annandale, approaching the borders of England, and especially in the parishes of Kirkpatrick-Fleming, Gretna, and Canobie, a great breadth of moss is met with, but the extent, although still large, is much reduced; and, this, where drained, improved, well cultivated, and manured, makes good land, and yields heavy crops of grain and roots. Eskdale is almost entirely pastoral; the breed of Cheviot sheep in Eskdalemoor being superior to any in Scotland, regarding which more will be said anon.

Having thus briefly glanced at the natural statistics of Dumfriesshire, its divisions, climate, soil, &c., we shall now proceed to the more important part of our report, viz., the different systems of agriculture practised, which may be divided into three classes or branches—first, mixed; second, arable; and third, purely pastoral farming.

First, then, we shall notice mixed farming as being the most extensively carried out in Dumfriesshire, the farms (especially in certain districts) being better adapted for this class than any other; and to illustrate our subject we shall take for example farms of 300 acres arable land—that is, land which is or has been under the plough, together with pasture to carry a flock of 1000 sheep and some young cattle; this description of farms being very common throughout Dumfriesshire, especially in Upper Annandale and Nithsdale, but of course varying in size, &c. On a farm of this kind two regular pairs of horses are usually kept, with young or odd ones to harrow, &c. in spring, and from 60 to 80 acres of white crop, and 30 to 40 of green crop grown, leaving from 180 to 200 acres in pasture, on which cattle and sheep are grazed during summer. The straw, and any hay there may be, is consumed by horses, feeding-cattle, cows, and young stock, in the byres and sheds during winter, which also require a proportion of turnips pulled, the remainder being eaten on the ground by sheep. This is the plan usually followed out in the arable department; and next as to the sheep. Out of a flock of 1000, there will be 800 ewes of different ages, the remainder being hogs bred on the farm for beating up stock, which are wintered on the arable or low ground. The lambs of the 800 ewes are usually sold in August (except the top ewe lambs which are kept for stock), either privately, or at the lamb fairs of Lockerbie and Langholm, where they are all shown, or at the character market of Sanquhar. The ewes, when six years old (being the general age), are drafted in the beginning of October, and sold, either for taking half-bred lambs off or turnip feeding.

The whole of the sheep are clipped in June, and the wool disposed of to local buyers or sent to the sales. This, then, is the general system followed out in the mixed system of agriculture; but frequently, instead of cows being kept to rear calves for grazing or feeding purposes, a dairy is substituted, and cheese made; which system, owing to the high price this valuable production has for the last two or three years been realising, is now becoming very general.

We have thus described the mixed system; and next in order comes arable farming; and we must here remark that, in the strictest sense of the term, there is no thorough arable farming done in Dumfriesshire, by which we mean the continuous cropping of the land, as is the case in the Carses of Gowrie and Stirling, and most of the highly farmed counties of England. Arable farming is principally carried on in middle and lower Annandale and Nithsdale, the farms varying from 60 or 70 to 500 acres in extent, the average being about 200, and the system generally adopted is the simple five-course shift, although, owing to stock having paid so well for the last six years, until the sudden downfall in the value of sheep within the last twelve months, many farmers have embraced the six-course rotation. The five-course shift is, however, looked upon as the legitimate one, many proprietors making it a rule to have a clause inserted in their leases, whereby the tenant is bound to carry out the fifth rotation; and the system of cropping is as follows:—First—oats (almost always), barley, or wheat; second—turnips, potatoes, mangolds, beans, or fallow; third—oats, barley, or wheat; fourth—seeds sown out, either cut or depastured by stock; fifth—second year's grass. Thus, on a farm of 200 acres, there are 80 acres white and 40 of green crop, the remainder being grass, part of which may be cut for hay or not, at the farmer's discretion. Very little wheat is grown in Dumfriesshire, the climate being too moist, while the soil is not sufficiently strong; so that oats and barley are the principal grain crops grown; but by far the greatest proportion is in oats. On the management of the second rotation—that is, for green crops—entirely depends the condition of the land until this rotation again comes round; for if it be well cultivated, thoroughly cleaned, and liberally manured, the effect will be apparent for years, and tell equally for good on the land, as a badly managed green crop break will for the reverse. On an arable farm the grain grown is mostly sold, although, of course, a proportion is used for the feeding of horses, cattle, sheep, and pigs; the good potatoes marketed, and the turnips partly consumed in the house by cattle, and partly by sheep on the ground. On a medium sized arable farm, say of 250 acres, a certain proportion of cattle and sheep are generally kept; but where there is a dairy, of course, it is very seldom that

there are any sheep, as they take the finest of the grass from the cows. Where sheep are kept, the general plan pursued by arable farmers is to purchase lambs, be they half-bred or Cheviot, at some of the lamb fairs in August or September, allowing them to run on the pastures and stubble until the beginning of November, when they are put into turnips, which are cut for them in spring; and, if liberally fed with corn and oilcake up to April, they are sent direct to the fat market, but if not prime, are sold to go into England, to be finished on some of the rich pastures during summer. On most arable farms sufficient cattle are wintered to convert the straw into manure, and a few usually stall fed, which are sold so soon as circumstances warrant. It is generally calculated, that for every 75 acres there are in one arable farm, a pair of horses are required the year round to get work done in due season. On many arable farms in Dumfriesshire large numbers of pigs are reared and fed; but this species of stock is not often very profitable, unless pork is commanding a high price, and grain and potatoes cheap, which sometimes happens. Harvest is generally earlier in certain districts of the county than in any other in Scotland, but the difference between the time the grain ripens in the early and late localities is from a month to six weeks. Thus the land around Dumfries, and in the parishes of Gretna, Kirkmahoe, and Tinwald, is very early, harvest generally commencing before the middle of August; while that in the parishes of Sanquhar, Kirkonnel, parts of Middlebie, Tundergarth, Kirkpatrick-Fleming, Half-Morton, and Canobie, is late, and harvest not general until the middle of September, most of these lands being cold and clay, and some undrained. The implements used in the cultivation of the soil are generally of good and approved construction. The reaping machine is becoming very common on large and medium-sized farms, and thrashing-mills, driven either by steam, water, or horse power, are upon every farm above fifty acres; but, so far, no steam plough has found its way into the county, although there are many farms on which one might be worked to advantage; but, generally speaking, the land is not favourable for steam cultivation, being too hard and stony. So far as regards arable farming, Dumfriesshire cannot certainly be said to rank among the foremost counties in Scotland; the Lothians, Berwickshire, Roxburghshire, Forfarshire, Stirlingshire, Perthshire, and Wigtownshire being decidedly in advance, although it must be admitted that there are many arable farmers in Dumfriesshire not to be excelled as practical and enlightened men, upon whom the management of their farms reflect the highest credit; and if distinctions were not odious in this paper, numerous instances of land as well farmed as any in the kingdom could be adduced.

The next system is pastoral farming, and if Dumfriesshire

does not rank high as an agricultural county, we question if it is second to any as a pastoral; for stock farmers seem to grudge no expense in improving their flocks and herds by procuring the best blood of both cattle and sheep; while, on the other hand, arable farmers generally seem disinclined to expend sufficient capital in the improvement of their land by liberal manuring and cultivation, the consequence being, that the crops grown in Dumfriesshire are certainly not what they ought or might be. while the sheep stocks are almost perfection. Why this should be the case we cannot tell, unless the stock farmer has more means at command than the arable.

Pastoral farming, by which we mean the farming of land which is, and generally speaking always has been, unploughed and entirely grazed, is chiefly carried on in Upper Annandale and Nithsdale, and throughout the greater part of Eskdale; and some of the finest farms in this class in the country are to be found in the districts mentioned, especially Eskdalemoor, where the soil is strong and deep, and the grasses succulent, raising sheep of great size and bone.

On many of the pastoral farms of Dumfriesshire 2000 to 4000 sheep are kept, and probably from 100 to 150 head of grazing cattle, sometimes dairy cows, which do uncommonly well feeding on this strong but coarse pasture. No ploughing or cultivation of any kind is done; but usually on such farms a large quantity of natural hay is cut (frequently 100 acres) to give to the sheep during winter in case of storms, and upon which the dairy cows are also wintered; and it is surprising to see the condition in which they come out in spring upon this keep alone.

Often there are superior dwelling-houses upon these farms; but being in out-of-the-way districts, they are not often occupied by their tenants, who have generally another farm, upon which they reside, in the low country. The life of an entirely pastoral farmer is a very easy one: the only busy times in the year being clipping, lambing, and weaning; all of which are, however, very important occasions. Lambing on the hills generally begins about the 10th April, continuing until the same time in May; clipping is done in June and July, the last week of the former and the first week of the latter month; the lambs are weaned in August, and the old ewes drafted in October. One or two horses are generally kept to cart coals, peats, meal, &c., for the shepherds, as well as to lead home the hay when secured.

We have thus endeavoured to describe as simply and lucidly as possible the different systems of farming practised in Dumfriesshire; and shall now pass on to the various kinds of stock kept, viz., horses, cattle, sheep, and pigs.

First, then, horses for agricultural uses, as well as for riding, driving, and hunting. For agricultural purposes, there are two

breeds of horses,—one, the pure Clydesdale; and the other, a thick-set, short-legged, compact animal, peculiar to the county, very useful, but without any particular name. We may here state that the farm-horses, as a rule, are anything but first-rate; but, as we said before, that there were exceptions with regard to the farmers, so there are as to the horses. There are really no first-class stables of farm-horses in Dumfriesshire; and any judge travelling along the roads for a day, will see but few really good horses in the carts, ploughs, &c. If any further proof were wanting, those interested have but to visit the local shows, where the very pick are exhibited; and how seldom do we see horses belonging to Dumfriesshire carrying away prizes at the Highland Society's shows? The horses kept are no doubt found to answer the purposes for which they are intended very well, but without any pretentions to quality or breeding in a general way. There are few first-rate thoroughbred sires kept for use in the county, and the thoroughbred mares, with the exception of those belonging to gentlemen connected with the Dumfriesshire Hunt, are anything but of good quality; consequently the class of hunting and harness horses is not first-rate. But as the county is not adapted for hunting (being too uneven, except in certain parts of it), nor the sport gone into with the same zest as in many counties of Scotland, it is not surprising the breed of hunters should be middling.

The next most important class of animals connected with the farm, is cattle, the principal district breeds being the Ayrshire, Galloway, and Shorthorn; but very frequently, for feeding purposes, the Ayrshire and Galloway cow is crossed with a Shorthorn bull, the produce of either being animals much sought after by the best feeders, who seem to prefer them to the pure breeds; besides which, they come to great weight—in some instances 80 to 100 stones, 60 being a very common one. Dairies being very numerous in Dumfriesshire, Ayrshire cattle occupy the most prominent place—cows of this useful and valuable breed being considered the best milkers, and at the same time easier kept than any other. Great attention is bestowed by farmers in endeavouring to develope the chief points of merit in Ayrshire cattle, be they male or female—a capacious and well-set udder in the latter being the principal object aimed at; although a straight back, with a sweet head and branching horns, are also viewed with favour in the show-yard. Many of the dairies in Dumfriesshire contain from 40 to 60 valuable cows (the average being about 30), and it is no unusual thing for some of the cows to give 4 gallons of milk per diem at the pride of the grass; and several first-class dairies average 18 stones of cheese per cow, which, when the price is 14s. or 15s. per stone, comes to something considerable in the year. Ayrshire bullocks, are

however, generally speaking, useless animals to feed, and never attain to a considerable weight, unless four years old, and at the same time are slow feeders; the consequence being that, as a rule, the male calves (unless first-rate ones, which are kept for bulls), are all castrated, milk given to them for a few weeks, and then sold to the butchers for veal. On the whole, however, for the dairy, the Ayrshire is by far the most useful breed; and in no county are there better specimens, as can be evidenced by the displays made at the local shows of Sanquhar, Thornhill, Lockerbie, and the Union Show held at Dumfries, where bulls, cows, and heifers of the very best stamp, and possessing every point of good breeding and quality, are to be seen. We might mention the names of many eminent breeders of Ayrshire cattle, but these are so numerous that it is not advisable. Next in importance comes the Galloway, an old and deservedly favourite breed, not so much for its milking properties as the excellence of the beef, being preferred in the English market to any other class of cattle, and frequently selling at from 6d. to 1s. per stone more than the Shorthorn or cross. Although, as we before said, the Galloway cow is not, generally speaking, a "pail-filler," yet the milk is very rich, and less makes a better calf than from the Ayrshire. In this breed, bullocks are as valuable as heifers, all calves being reared and carried on until they are ready for the butcher, at the age of three or four years, when they generally run from 50 to 60 stones in weight. The breed is on the decrease in Dumfriesshire, the best specimens of it coming into the county from Galloway, where there are many first-class breeders. Probably the best Galloway cattle in Dumfriesshire are to be found at the Duke of Buccleuch's home-farm on the Drumlanrig estate, where several Highland Society's winners can be seen. The last, and least extensive, breed is the Shorthorn; but in saying this, we do not mean to cast any slur upon this noble animal; but the climate is not good enough, nor the land sufficiently rich and heavy, to bring cattle of this fashionable breed to perfection. It is only by about half-a-dozen crack farmers, who have land suitable, that they are kept, although many keep a Shorthorn bull to put to their Ayrshire or Galloway cows. The Redkirk herd of Shorthorns, dispersed three years ago, was in great repute, and many splendid animals were sent thence to America, realising enormous prices. A well-bred and selected Shorthorn herd is kept at the Howes-farm near Annan, which at present stands foremost in the county.

We now come to sheep, the most favourite and numerous breed of animals connected with the farm; and in this class (especially Cheviot) Dumfriesshire stands foremost in Scotland, both as a feeding and breeding county. The breeds of sheep in Dumfriesshire are the Cheviot and Black-faced, this being the pure and native breeds of the county; but many farmers have lately com-

menced the rearing of Leicester rams. The heaviest and best Cheviot sheep in Dumfriesshire are found in Eskdalemoor, medium in Annandale (some of the sheep walks about Moffat carrying very good stocks), while the lightest are in Nithsdale, the land there being barer and higher than either in Eskdale or Annandale; at the same time, when brought into the low country to feed, &c., they are found to do uncommonly well. Cheviot sheep bred on Moodlaw, Capplegill, Garwald, Kirkhill, and Dumfedling, are well known to all farmers interested in Cheviot stock, but more especially the former; the sheep off Moodlaw, under Mr Brydon's painstaking and judicious management, being invincible wherever exhibited in the public show-yard. Fabulous prices have been realised by Mr Brydon for his rams at his bi-annual sale at Beattock, "Glenpatrick" having been sold this season in September for the enormous figure of 185 guineas, the highest price ever paid for a Cheviot sheep; while many others sold from 50 to 120 guineas. Blackfaced sheep are almost entirely confined to Nithsdale; but this breed is not nearly so numerous nor valuable as the Cheviot. Many of the Blackfaced stocks in Dumfriesshire are excellent, and great pains taken in their management; but none stand out so prominently among them as the Moodlaw flock does among the Cheviots. Leicesters are in small compass in the county, and only kept by a few gentlemen; but the rams bred by Mr Irving of Whitehill are considered very good. On a number of arable farms the draft ewes (both Cheviot and Blackfaced) are brought down from the hills and crossed with Leicester rams, the produce being a lamb much sought after by feeders, possessing the feeding properties of the ram, and the hardiness of constitution of the ewe.

Although a great bacon producing county, the breed of pigs is very inferior—in fact, few feeders can tell the breed of their animals; but they are not great favourites, except on dairy farms, where they can be inexpensively and well fed through summer on whey.

The improvements which have taken place on the various estates throughout Dumfriesshire during the present century, such as building, draining, and fencing, have been both numerous and extensive; but much yet remains to be done, especially on hill farms, which have not participated as much in liming and draining as the arable ground, although, owing to the high price of sheep for the last six or eight years, more attention is now being paid to them. Dumfriesshire having always stood well as an agricultural county, the improvements carried out have been progressive, consequently the appearance of the land has not been so rapidly changed as in many backward counties, A very large extent of moss has been reclaimed during the last

fifty years, and land which, within that time, was simply growing wild heather, is now, by paring, draining, and cultivation, bearing excellent grain and green crops. There is yet, however, a very large extent of moss to break in, which will be the work of many years, but if this was accomplished the improvement of the low lands would be almost complete; and we know of no better subject for improvement than the wide tract of country known as Lochar Moss, the land which has been already reclaimed from it having proved very productive. Draining has been carried on very extensively for the last twenty years, and on many arable farms there is scarcely a field undrained, while on others very little has been done; and this operation is now being extended to the low hill pastures, so that in the course of ten years little land, high or low, should be left wet. On many estates throughout the county the farm-house, offices, and cottages have been lately much improved, especially on the Duke of Buccleuch's estate in Upper Nithsdale, where the whole of the buildings are in first-rate order, and most of the dwelling-houses, especially on the larger farms, resembling gentlemen's mansions. Under such an enlightened and generous landlord, the tenantry enjoy special advantages; and the contrast between the appearance of the country around Drumlanrig generally, as compared with the lower district of Annandale, is very marked. Holstane and Tibbers, the two home-farms of the Duke of Buccleuch, will well repay a visit to those interested in farming, the buildings being in the model style, while at the former a first class Ayrshire, and at the latter a Galloway stock is kept. Although the farm-houses and buildings are generally good throughout the county, there are no very fine steadings, such as are met with in many counties; still the homesteads of Holstane and Tibbers, Gateslack and Drumcrub, in the parish of Durrisdeer; Porterstown and Barndennoch, in the parish of Keir; Kirkland and Dabfibble, in the parish of Kirkmichael; Pennersaughs and Broadlee, in the parish of Middlebie—all on the estate of the Duke of Buccleuch; Old Gretna and Longbridgemoor, on the estate of the Earl of Mansfield; Howes, the property of Mr Mackenzie of Newbie; and Stapleton Burn, the property of Mr Critchley of Stapleton, are large and commodious, and afford every convenience for stock, as well as the proper working and management of the respective farms. The fences generally are not good, except on the Drumlanrig estate, on which a regular staff of hedgers is kept, the landlord and tenants bearing equal share of the expense, and the consequence is that the hedges are in a complete state of repair, and add much to the beauty of the district. It would be well if some arrangement of this kind was more frequently made, especially in Lower Annandale, where the fences are in a wretched state;

but those in the upper part of the county are generally stone, which are easily kept up, and at the same time are excellent shelter for stock. Although lime is plentiful and cheap throughout the county, there is not so much used as might be; and it would be advisable if farmers were bound by their leases to lime all their land once during the currency of their lease, as sufficient advantage is not taken of this valuable fertiliser, which is by far the cheapest manure that can be used. The principal landed proprietors in Dumfriesshire are the Duke of Buccleuch, whose rent roll reaches nearly L.80,000 per annum; the Earl of Mansfield; Marquis of Queensberry; Mr Hope Johnstone of Annandale; Sir William Jardine of Applegarth; Sir Frederick Johnstone of Westerhall; Sir John Heron Maxwell of Springkell; Mr Jardine of Castlemilk, M.P.; the Misses Baird of Closeburn; Messrs Curruthers of Dormont; Mackenzie of Newbie; and Leny of Dalswinton.

REPORT ON THE PRUNING OF THE RARER CONIFERÆ.

By Robert Hutchison of Carlowrie, Kirkliston.

[*Premium—Medium Gold Medal.*]

We are aware that, in advocating the pruning of coniferæ, especially of the rarer and more recently introduced varieties, we are opposing the opinion and practice which is commonly received and followed on the subject. Many foresters, even among those who use the pruning-knife and chisel freely upon hard-wood trees, never interfere in any way with the habit and growth of a conifer, deeming that the risk of fatal injury from gumming, or bleeding, is so great as to counterbalance any good that might be expected to result from removing superfluous and ill-placed branches. The consequence of this course of action may be seen all over the country in the gaunt specimens of larch, silver, spruce, and Scots fir, which are constantly met with—much too small in diameter and trunk for their height, and carrying too little timber for their age; whereas, had these trees been subjected in their youth to a system of judicious and skilful pruning, they would have been materially improved, not only in beauty but in value. It is much safer and better, however, under any circumstances, to leave trees to grow as nature and the soil prompt, than to commit the chisel or pruning-knife into the hands of an ignorant and unskilful workman. One forester's injudicious pruning may do mischief which years will not repair; and it is much to be regretted that in many cases the care of plantations is committed to untrained and consequently unskilful hands. The pruning of *coniferæ*, in parti-

cular, requires to be conducted with great care and judgment, and we are convinced that the beneficial results of such pruning would very soon be apparent.

In pruning coniferæ, the great risk of injuring the tree, by inducing too much bleeding or gumming, should always be borne in mind; and to obviate this danger we would suggest that, wherever it is practicable, "pointing" or "disbudding," by pinching off with the fingers the terminal points of lateral shoots, is the safest mode of pruning to adopt, and if done at a sufficiently early stage of the growth of the rebellious branch, no further treatment will be found necessary. Should it, however, be needful to remove a large branch which is disfiguring the tree, and whose existence had been overlooked till it attained considerable dimensions, we would not hesitate to cut it back, if it is a *lateral* branch, to one half of its length, if necessary, but we would carefully avoid removing it close to the main stem, as it is of great importance in pruning resinous trees not to inflict a wound very near the trunk, because the bark in healing grows up round the edges of the wound in the form of a cup, forming a receptacle for the rain, and as the wood of trees of the pine tribe is of an open and porous nature, the water eats into it, forming black knots in the timber which materially detract both from its beauty and value. If, for any reason, it is absolutely necessary to remove a branch *close* to the main stem, a preparation composed of equal parts of Archangel and coal tar, boiled together till of a proper thickness, and when cold applied with a common paint-brush or a piece of wood, will be found very useful in excluding the air and preventing rot. This mixture is also very valuable for applying to small branches of the rarer coniferæ which may require foreshortening, and we would recommend every person who is interested in pine culture to keep a tin flask of it ready for use.

If it is needful to remove a *large* branch from any valuable specimen tree, the risk in doing so will be much obviated by *preparing* the branch for its removal. The method we pursue is to cut it back about one-third of its length, and then to denude the limb of its young shoots; by these means we lessen the flow of sap in the part, and after a little time the removal of the rest of the limb may be effected with comparative safety. It is of great consequence in pruning coniferæ to go to work gradually, and not to do too much at one time, as over-bleeding or gumming is very apt to ensue when the wounds made are either numerous or large. We may remark, that a ragged abrasion bleeds far less than a clean cut, and for this reason we always employ the "*averuncator*," when its use is at all practicable; it easily cuts branches off an inch in diameter; and for amputating large limbs close to the trunk of the tree we find a saw answers best. The superiority of the averuncator to an ordinary knife may

easily be tested by cutting two twigs of Weymouth pine (*Strobus*) of two years' growth, one with a knife, the other with the averuncator, when it will be found that the wound made by the latter will not only bleed far less, but will also heal much more quickly than that made with the knife—the bruised grain of the wood acting as a kind of salve or plaster to exclude the air. We consider the averuncator quite indispensable for the successful pruning of coniferæ; and we would also recommend every pruner to possess a good hand-knife, a long-handled hedge bill and shears, a Kentish bill (Fenn's, Newgate Street, London), fine and rougher hand-saws, and a long-handed down-cut saw.

Although the method of pruning is the matter of most consequence, the state of the tree and the season of the year have also much to do with the successful issue of the operation, for the same tree will exhibit very different results from being pruned at different stages of its growth and in various conditions of climate. Generally speaking, the younger a tree is the better it will bear pruning, and the more marked and decided will be the benefit it derives from the operation; indeed, we would strongly recommend a regular system of examining all nursery lines and young conifers in borders, for the purpose of removing at once any superfluous or misplaced shoots, and we are convinced that the trouble of doing so would be amply repaid by the increased strength and vigour of the plants, as well as by their more graceful form. Another great advantage resulting from the proper training of plants in their infancy is, that trees which have been carefully pointed and disbudded when they were young will require very much less pruning and interference with afterwards than specimens which have been neglected in their youth; and it must be always borne in mind that the removal of a large branch from a tree which has attained maturity is not only attended with a certain amount of danger to the life of the plant, but that it invariably leaves an unsightly scar, and very often makes a blank in the leafage of the tree, which is not supplied by the other branches for many years.

With regard to the season of the year at which the operation of pruning is attended with most success, we think that June will probably be found the best month in which to remove rival leading shoots and to pinch in obtrusive side twigs; but as it is always better, if possible, to rub out the bud-eyes of double tops, this should be done in spring, as soon as the offending point is observed; indeed, conifers may be pruned with complete safety at any time late in spring if the weather is favourable, or about the end of October after a dry autumn. The Larix tribe do not bear pruning well in summer, as they are apt to bleed too freely if wounded at that season; but Mr Skirving, of Walton Nurseries, Liverpool, who is a most experienced and skilful manager of

coniferæ, informs us that as late as the month of May he has pruned the *Cedrus deodara* and *atlantica* with complete success. The Murthly pines, which are beautiful specimens of what conifers may become under good management, are pruned when necessary, if the weather is suitable, in November, December, and January; while many persons, whose opinion on the subject is valuable, select the end of October for the operation. When the specimens stand singly, and the averuncator alone is used, they may be pointed at any season.

There are many beneficial results attained by the judicious pruning of conifers, and indeed we consider that, as a family, they benefit most materially by the process. The liability to lose their leaders, to which many of the newer coniferæ are subject, may be obviated by a careful attention to pruning. By foreshortening the branches of each of the three upper tiers to one-third of their length, a stronger leader is secured, and nature herself will often complete the cure. Should this operation, however, not prove completely effectual, and several heads appear, all the bud-eyes except the centre one must be carefully rubbed out, and after a year or two of such treatment the leading shoot will have acquired sufficient strength to hold its own ground against all rivals. Besides improving the beauty of the tree, this treatment will be found materially to enhance its value as timber, for the sap which would have gone to nourish large superfluous limbs, being all retained in the main stem, vastly increases the bole of the tree, and improves the quality of timber. Instances have occurred in which spruce trees so foreshortened and trained, have made nearly a third more timber in the trunk than unpruned specimens of the same age growing beside them.

When it is desired to grow the *Cedrus deodara* on a heavy soil, upon a close clay subsoil, pruning will be found imperatively necessary, to enable the plant to throw up a leader, and assume the tree habit; for on clay the *deodara* inclines to grow like a thick straggling bush, and the only way to overcome this tendency is to cut off the lower tiers of branches, and to thin out by the foreshortening process the two upper tiers of young wood. The *Cedrus libani* in its young stage, till it has attained the height of four feet, requires the same treatment, and will be found to benefit much by it.

There are some conifers which will not stand the use of the pruning-knife, but they are few in number. None of the Pinus family bear pruning well, and the Scotch fir (*Pinus palustris*) proves quite intractable under the treatment. All the Pinus family bleed so freely when cut as to run a great risk of perishing in the process. The only way in which they can be trained with safety is by "finger-pruning" or "dis-budding," and if under any circumstances it is requisite to have recourse to fore-

shortening, the tar ointment already referred to should immediately be applied. The Picea family also bear pruning badly, but their habit is by nature so pyramidal and regular as to render any interference, except by "disbudding," quite unnecessary. When, however, the *Picea nobilis* is grown from a graft instead of from seed, very *severe* pinching when young is necessary to obtain a good plant; and in some cases it has been found needful, after the graft had attained nearly the length of a foot, to cut it back close to its junction with the stem, and confine it to one bud, in order to overcome the lateral habit of the graft. *Pinus cembra* and *Pinus austriaca* have in some instances within our knowledge been cut back in their sides without any damage resulting to the health of the tree, but these are exceptional cases. The *Araucaria imbricata* is another conifer which bleeds exceedingly freely when cut at any season of the year, even when the branch has been previously prepared by shortening, so in this case the "disbudding" or "rubbing-out" process of pruning is the only one that can be adopted with impunity. Fortunately the instances in which interference with the habit of growth of the araucaria is necessary are very rare; and seeing that the Pinus and Picea genera are so easily injured by pruning, we would not recommend it to be attempted with them, except in the case of "forking," or throwing up a double leader.

When a side shoot threatens to grow vertically at the point, and so contend with the proper leader in a specimen plant which will not bear cutting, we have found it a good plan to give the offending branch a twist downwards, so as to weaken it and induce it to grow laterally, or to hang a weight to it with a piece of cord; and if of a confirmed and obstinate tendency, it is advisable to have the shoot pegged back by means of a crooked stick, which may be fastened either to the stem or to a lower branch. In this position it should be retained for several months, until the vertical tendency has been quite overcome.

Conifers grown on poor soils and in cold exposed situations require but little pruning, and it should be carefully and sparingly administered in such circumstances. Most of the branches should be left, unless the trees are so thickly planted as to cause interlacing, and even then thinning out the trees will be found more advantageous than pruning. In wet, damp, heavy soils, and in sheltered or confined situations, on the other hand, pruning will be found quite indispensable for promoting the freer circulation of air, and for assisting the trunk of the tree to secure a fuller share of nourishment by the removal of superfluous branches, and thereby preventing the close "drawn-up" habit which trees in such localities are apt to assume.

It must be always borne in mind, however, in pruning a conifer, especially the newer and more recently introduced varie-

ties, that the object to be aimed at primarily is to assist the tree in attaining the shape for which it was intended by nature, and not to contort it into any fanciful or artificial form.

REPORT ON THE COMPARATIVE PRODUCTIVENESS OF TURNIPS.

By John Milne, Mains of Laithers, Turriff.

[*Premium—Medium Gold Medal.*]

Whether we take its extent, or its value in the production of beef and mutton, the turnip crop is the most important of all green crops to the British farmer. Indeed, a large extent of light soil in the northern counties of Scotland could scarcely be cultivated profitably were it not for the valuable turnip crops which such soils generally produce. It is of the utmost importance to the stock-farmer to produce a large, sound, and nutritious crop of turnips. Hitherto, the attention of experimenters has been directed chiefly to the manures which assist in the production of large crops. Comparatively little attention has been directed to the relative weight and quality of the different varieties, though considerable differences are generally believed to exist. If sown for a few successive years on poor unmanured soil, the turnip rapidly degenerates from a large fleshy bulb to a small elongated fibrous root. In such a case the bulb shrinks into the taproot, and it requires years of careful cultivation to restore it to its former value; hence it is of importance to use seed grown for a series of years from full-sized transplanted bulbs; and the difference in productiveness between one variety and another, or between two samples of the same variety, may be entirely due to the method in which the seed has been raised. The method of growing seed also influences, in some cases at least, the soundness of the crop. We have repeatedly seen the produce of one sample of seed badly affected with anbury or "finger-and-toe;" while another sample of the same variety, sown alongside, remained almost sound. How such a difference should occur is very mysterious, and is deserving of careful investigation.

The following experiments on the comparative productiveness of different varieties of turnips were made in the years 1864, 1865, and 1866, on a farm in Aberdeenshire, 12 miles inland, and about 250 feet above sea-level. The soil is light turnip soil, incumbent on clay slate. The rotation is five-course. The manures applied in each case were 15 tons of farm-yard dung, 1 cwt. of Peruvian guano, 2 cwt. of bone dust, and 2 cwt. of superphosphate. The plots consisted of 4 drills of each variety. All were topped and tailed, and weighed in the field on a sack-weighing machine.

EXPERIMENTS ON THIRTEEN VARIETIES OF SWEDES IN 1864.

LOT.	VARIETY.	SEED PURCHASED FROM	TONS PER ACRE.	SPECIFIC GRAVITY.
1	Drummonds' extra improved,	Wm. Drummond & Sons, Stirling,	15·804	1·0092
2	East Lothian,	Lawson & Son, Edinburgh,	15·804	1·0025
3	Do.,	Mr John Hutcheon, Turriff,	16·607	1·0041
4	Green-top,	Lawson & Son,	12·946	1·0169
5	Do.,	Mr John Hutcheon,	13·035	1·0271
6	Laing's swede,	do.	16·607	1·0167
7	Shepherd's golden-globe,	do.	14·955	1·0122
8	Skirving's purple-top,	do.	14·911	1·0142
9	Do.,	Lawson & Son,	13·035	1·0127
10	Bangholm swede,	do.	16·562	1·0131
11	Champion swede,	Mr John Hutcheon,	15·535	1·0100
12	Kinaldie swede,	Mr Milne, of Kinaldie,	16·919	1·0140
13	Skirving's king of the swedes,	Mr Skirving, Liverpool,	15·268	1·0095
14	Drummonds' extra (same as Lot 1),	Wm. Drummond & Sons,	16·116	1·0092

The seed was sown on 25th May, and the crop was lifted and weighed on 9th December. The season of 1864 was favourable to the growth of the turnip crop. The weights indicated are about the average of the district.

EXPERIMENTS IN 1865—SWEDES.

LOT.	VARIETY.	SEED PURCHASED FROM	TONS PER ACRE.
1	Drummonds' extra improved,	Wm. Drummond and Sons,	12·051
2	East Lothian purple-top,	do.	11·787
3	Green-top,	Mr John Hutcheon,	12·412
4	Laing's swede,	Wm. Drummond and Sons,	10·075
5	Shepherd's golden globe,	Mr John Hutcheon,	12·000
6	Skirving's purple-top,	do.	12·150
7	Bangholm swede,	do.	13·001
8	Champion swede,	do.	12·875
9	Hardy green-top,	Wm. Drummond and Sons,	13·212
10	Improved red-top,	Lawson & Son,	13·175
11	Skirving's ringed blue,	Mr John Hutcheon,	12·600
12	Shepherd's golden-globe,	do.	13·600
13	Mixture of all the above kinds,		11·800

EXPERIMENTS IN 1865—YELLOWS.

LOT.	VARIETY.	SEED PURCHASED FROM	TONS PER ACRE.
1	Wait's improved,	Home-grown,	8·806
2	Green-top,	Mr John Hutcheon,	8·912
3	Green-top, Aberdeen,	Wm. Drummond and Sons,	12·342
4	Dale's hybrid,	do.	11·212
5	Imperial purple-top,	do.	11·000
6	Purple-top yellow,	Mr John Hutcheon,	11·562
7	Tweeddale purple-top,	Wm. Drummond and Sons,	9·650
8	Early yellow,	do.	12·425
9	Early field yellow,	Mr John Hutcheon,	8·518
10	Skirving's purple-top,	do.	12·093
11	Long tankard,	Wm. Drummond and Sons,	12·064
12	Robertson's golden ball,	do.	11·150
13	Mixture of all the above kinds,		11·006

EXPERIMENTS IN 1865—WHITE TURNIPS.

LOT.	VARIETY.	SEED PURCHASED FROM	TONS PER ACRE.
1	Green globe imperial,	Wm. Drummond and Sons,	13·125
2	Greystone,	do.	14·625
3	Pomeranian white,	do.	13·875
4	Red Lincolnshire,	do.	11·937
5	Mixture of all the above kinds,		12·800

The swedes were sown on 23d May, and the crop was lifted and weighed on 28th December. The yellows were sown on 2d June, and the crop was lifted and weighed on 28th October. The white turnips were sown on 7th June, and the crop was lifted and weighed on 10th November.

The season of 1865 was extremely dry throughout. The turnip crop on light soils came up beautifully, and grew well till about the middle of August, when, in consequence of the continued dry weather, it became almost universally affected with mildew, which very much interfered with the development of the bulbs, and the crop turned out very light.

EXPERIMENTS IN 1866—SWEDES.

LOT.	VARIETY.	SEED PURCHASED FROM	TONS PER ACRE.
1	Drummonds' extra improved,	Wm. Drummond and Sons,	16·850
2	East Lothian,	do.	14·250
3	Green top,	do.	14·700
4	Laing's swede,	do.	13·150
5	Kinaldie swede,	Home-grown,	14·750
7	Aberdeen yellow on same land,	do.	23·775

EXPERIMENTS IN 1866—YELLOWS.

LOT.	VARIETY.	SEED PURCHASED FROM	TONS PER ACRE.
1	Wait's improved,	Home-grown,	12·955
2	Green-top,	Mr John Hutcheon,	17·425
3	Green-top, Aberdeen,	Wm. Drummond and Sons,	14·625
4	Dale's hybrid,	do.	13·675
5	Imperial purple-top,	do.	14·450
6	Purple-top yellow,	Mr John Hutcheon,	14·500
7	Tweeddale purple-top,	Wm. Drummond and Sons,	12·250
8	Early yellow,	do.	13·025
9	Skirving's purple-top,	Mr John Hutcheon,	16·125
10	Long tankard,	Wm. Drummond and Sons,	13·825
11	Tweeddale purple-top,	Mr John Hutcheon,	16·800
12	New hybrid,	Wm. Drummond and Sons,	14·600
13	Green-top, Old Meldrum variety,	Mr John Hutcheon,	12·650
14	Green-top golden yellow,	do.	12·600
15	Mixture of all the above kinds,		15·425

EXPERIMENTS IN 1866—WHITE TURNIPS.

LOT.	VARIETY.	SEED PURCHASED FROM	TONS PER ACRE.
1	Green globe imperial,	Wm. Drummond and Sons,	19·625
2	Greystone,	do.	16·250
3	Pomeranian white,	do.	17·750
4	Red Lincolnshire,	do.	15·750
5	Mixture of all the above kinds,		18·350

The swedes were sown on 19th May, and the crop was lifted and weighed on 5th December. The yellows were sown on 14th June, and the crop was lifted and weighed on 5th December. The white turnips were sown on 18th June, and the crop was lifted and weighed on 5th December.

The season of 1866 was, in the north of Scotland, highly favourable to the growth of the turnip crop, which was above an average, with the exception of some fields where anbury or "finger-and-toe" prevailed. The experimental plots were all somewhat affected by the disease, which reduced the weight of the crop.

General Observations.—The purple-top varieties of swedes, and also of yellow, are all more or less oblong or oval in shape, consequently the bulbs stand farther out of the ground, and are more exposed to the deteriorating action of frost than those of a more globular shape. They are usually of less specific gravity, but if used early, or if lifted and stored, they are quite as good as the green-top varieties, and they usually grow to be a heavier crop. The green-top varieties are generally of a round or globular shape, the bulbs do not stand so far out of the ground, and are more easily earthed up than the purple-topped varieties.

Wherever it is practicable, the great bulk of the turnip crop should be lifted and stored by the end of December, so as to avoid the risk of severe bare frosts, which in some years deteriorate the quality and weight to a great extent. We have tried the specific gravity of turnips, both before and after a severe bare frost, and found swedes reduced by it from 1·01 to ·92, and even to ·90, while yellows were reduced from about ·1 to as low as ·8, which showed that one-fifth of the entire weight had disappeared; and the feeding qualities were so reduced, that, to keep the cattle in an improving state, we had to use an additional quantity of oilcake, not previously calculated upon. If the crop is lifted and properly stored, all risk from frost is avoided; and even white turnips, if sound when lifted, can be kept till the warm weather of spring induces decay in the heap.

Drummonds' extra improved purple-top swede is a large free-growing variety; it produces a heavy crop of large fleshy bulbs. On account of its tankard shape it does not stand frost well, and the top or shaw is rather coarse. For early use, or if lifted and stored before severe frost, this is one of the best varieties in cultivation.

East Lothian purple-top is an excellent variety; it produces a good crop of oval-shaped bulbs.

Green-top is a very hardy variety, of excellent shape; stands the winter well. The weight per acre is seldom so great as the purple-top varieties.

Laing's swede did well in 1864. We sowed a few acres in 1865, but were disappointed with the result. It seems too

delicate for general cultivation. It is very distinct in appearance; the leaves are cabbage-shaped, low, and spreading.

Skirving's purple-top is a very good variety, brought out by Mr Skirving of Liverpool.

Bangholm swede, brought out by Messrs Lawson & Son, appears well adapted for general cultivation. It is purple-topped, and oval in shape.

Champion swede is a purple-topped variety; its weight per acre was under some of the others.

Kinaldie swede, improved by Mr Milne of Kinaldie, is one of the best varieties in cultivation; unexceptional in shape, weight, and quality.

Skirving's king of the swedes is a purple-top variety, somewhat resembling Drummonds' improved, but not such a free grower.

Shepherd's golden globe seed, grown in Morayshire, is a purple-topped swede, with a coarse crown. There appears to be two varieties with this name.

Wait's improved yellow, brought out by Mr Wait of London, does not seem to have fixed characteristics, and produced lighter weights than some of the others.

Green-top, when well grown, is an excellent variety, producing a good crop of sound nutritous bulbs. The great influence of good seed is well seen in experiments with this variety.

Dale's hybrid, a useful variety, does not appear to grow so heavy a crop as some of the others.

Purple-top is a free growing variety, but inferior to Tweeddale, which was selected from it.

Early yellow is excellent either for early or late sowings. If sown by the middle of May, it will be ready for use by September. It is beautifully globular in shape, grows to a large size, and is of fine quality.

Long tankard is a free grower, but is suitable only for early use.

Green globe imperial grows to a large size, and is of good quality. It appears to be the hardiest of the whites.

Greystone is a large free grower, but of coarse quality.

Pomeranian white is a globular turnip, of good quality and large size.

Red Lincolnshire is inferior to the others, both in weight and quality.

REPORT ON SCAB IN SHEEP.

By Hugh Borthwick, Shepherd, Middlestead, Selkirk.

[*Premium—Five Sovereigns.*]

Among the diseases of the skin British sheep, especially Scotch, are subject to, the scab stands predominant in frequency of occurrence, deterioration to the wool, the flesh, and the thriving of the animal; and if allowed to gain a footing amongst a flock of sheep, and means are not taken to arrest its progress, there is no disease sheep are subject to that spreads with so ruinous effect both to the flock and flock-master. It attacks young and old, from the suckling lamb of fourteen days to the aged dam of six years old. Its ravages are as severely felt amongst the hardy blackfaced breed of the Highlands, as among the more tenderly constituted breed of the Lowlands; in fact, there is no variety of breed, age, or condition of sheep able to repel its attacks. If it has fairly gained a footing amongst a hirsel, the contagion is communicated in a more or less degree according as sheep come in contact with each other. Thus the disease spreads more rapidly amongst a flock of sheep grazing in parks than on the wide and mountainous ranges. Scab in sheep is something akin to itch in the human being; and amongst flock-masters of experience and good management it is looked upon with the same abhorrence in the sheep as a family of human beings effected with this disease are viewed by every individual they come in contact with. Itch in a human family that has existed for any length of time is denounced by the highest medical authority as the result of ignorance, indolence, or sloth; and the acute practical stockman does not hesitate to apply the same reprehensible language to his neighbour who allows his stock to be overrun with scab. These are strong assertions, but they are no less strong than true. There is no doubt scab may, and does occasionally, break out amongst the best-managed flocks; but it is always imported, or the result of having come in contact with diseased animals; but I have never known it spread to any extent if the proper cure is applied with alacrity, which I will afterwards endeavour to prove.

The symptoms are easily recognised. In the first stage of the disease, a sheep is observed to bite or pull with its teeth a few fibres from the wool, consequently a spot of a whiter hue is observed than the general colour of the coat, and is commonly termed "flowering" by shepherds. As the disease advances, the animal becomes very irritable and uneasy, rubbing itself against every projecting part of a dyke, post, or earthen bank that comes in its way, and tearing off the wool with its teeth from every diseased part of the body it can lay hold on.

By degrees the skin becomes hard, large patches of scab are formed, and the wool comes off in considerable flakes; the animal looses condition rapidly; no amount of liberal feeding will sustain it; on the contrary, it has rather a tendency to aggravate the disease, and sooner or later the animal falls a prey to the tormenting disorder—a distressing spectacle of the negligence and inhumanity of the owner. If sheep are first attacked with scab on a part of the body where neither its mouth nor feet can reach, the symptoms may for a time pass unobserved, but generally an uneasiness will be recognised before the disease spreads to any extent. No definite period can be stated how long a sheep will sustain life under the disease. A good deal depends upon the constitution and condition of the animal when attacked, also upon the period and state of the season, at least upon hill pasture. For example, if a sheep is effected with scab in the end of the year, and means are not taken to cure it, if the winter is stormy it runs a great risk of dying of poverty in the spring. A strong proof of this fact came under my own knowledge in the severe winter and spring of 1860 and 1861, in the county of Mid-Lothian, where a hirsel of sheep, numbering between 400 and 500, had been effected with scab for some years previous, no effectual means having been taken to eradicate the disorder, and by the month of May 1861, only about forty remained alive.

It is asserted by some writers of high authority that scab assumes different forms in different seasons; the only forms of the disease in the south of Scotland that have come under my own observation have all a striking resemblance. When the animal is examined in the first stage of the disease, where it has been scratching or biting off the wool with its teeth, small red pustules or pimples are observed, the skin feels hard to the touch, and if scratched with the finger or any instrument the animal exhibits a remarkable uneasiness, chacking with its teeth, and will even seize the operator and bite severely; and at no time, either in health or labouring under any other disorder, will a sheep attempt to bite a human being except when suffering from scab. By degrees the pimples spread over the body, the skin becomes rough and hard, an extensive eruption ensues, large patches of crust or scab are formed, which increases over the body, and ultimately the animal becomes exhausted from continual suffering, or dies of poverty by the perpetual irritation. I have never had any experience in the post-mortem examination of scabbed sheep, consequently can give no minute account of the appearances from my own observation; and, as I have already hinted, there ought to be no deaths of sheep from scab, as it yields readily to treatment, and a post-mortem examination is either the result of ignorance or negligence, or allowed to take place to derive information.

Youatt describes the appearances as very uncertain and inconclusive. He says there is generally chronic inflammation of the intestines, with the presence of a great number of worms; the liver is occasionally schirrous, and the spleen enlarged; and there are frequently serous effusions in the belly, and sometimes in the chest. There has been evident sympathy between the digestive and cutaneous systems. Several of these appearances, however, are observed in ill-nursed lambs and old sheep dying of poverty, although free of scab. In the former, the intestines are often invaded with worms to a great extent, and water is found both in the belly and chest; whereas, in old sheep dying of poverty, water is very often in the chest. I once slaughtered a strayed sheep effected with scab, to prevent the disease from spreading amongst the flock I had the charge of, and found no trace of disease internally; all the organs were apparently healthy; the animal affected, however, was in the first stage of the disorder.

It is clearly ascertained by scientific men that the scab in sheep, like the itch in the human being, is connected with and propagated by certain minute insects belonging to the class of acari, which inhabit pimples or pustules. But the question naturally arises, How came they first into existence? This problem is very difficult of solution, and puzzles the most eminent physiologists. But, as I have already said, I have never known it break out spontaneously amongst a flock of sheep properly managed, during a period of thirty years' experience as a shepherd in pastoral districts. This fact alone, I think, is conclusive proof that its origin must be sought for in mismanagement. To show what kind of mismanagement is most liable to produce the disease, I will quote the authority of my late employer, Mr Gardner, who was at one time and for many years a large flock-master in Australia, where the disease prevailed to a great extent. Amongst settlers in Australia the idea was common that when sheep were heated by being overrun with dogs, and being huddled close together into folds all night, as was the custom in the colony, the heating and overcrowding, combined with the fold at times getting foul or dirty, had a great influence in producing the disease in that warm country.

Mr Gardner, however, states from his own experience that he generally could trace scab amongst his own flock to have been communicated from buying sheep affected with scab, or having come in contact with some neighbouring flocks so affected. Nevertheless, it is quite evident that overheating or overcrowding in folds, especially the latter, has a tendency to bring on disease of the skin. A strong proof of this fact came under my own observation on several occasions. It was the practise on the farm of Traquair Knowe, for several years to draw from the stock a few of the worst conditioned and unthriving sheep in the month of October,

amounting from ten to twenty in number. They were generally confined in a small enclosure, well sheltered, and fed off for the butcher on cut turnips, corn, and hay. They were allowed to remain white, that is, no dipping or smearing was had recourse to, and in the beginning of the spring of each year an unusual eruption broke out on the skin, and although it could not be termed scab, still the wool began to fall off, and there was a certain irritation or itch about the skin which prevented the sheep from feeding, and they had always to be sold off in the course of three or four months after the feeding had begun. It may be argued that the want of dipping or smearing was the cause of the eruption on the skin. This, however, was not the case, for amongst the rest of the feeding sheep, also undipped or unsmeared, varying in number from five to twelve score, enclosed in a turnip field and fed in the same manner, nothing of the kind ever appeared on the skin although fed for a longer period. Thus I think it is clear that confining sheep too close is injurious to the health, and has a tendency to bring on disease of the skin, and may, if persisted in for any length of time, combined with other causes of mismanagement, produce scab, and in this respect it only follows the laws by which other diseases are governed, and are produced in a great measure by neglect or mismanagement. For example, sturdy in sheep, the hydatid in the brain of sheep, is a parasitical insect propagated in a great measure through improper nourishment and shelter of the animal. Mr Gardner states that moist, showery weather had a great influence in spreading the disease. When the weather had been dry for a long time only slight symptoms were visible amongst the flocks, but when it changed into soft and frequent showers, the disease spread with alarming rapidity. This fact is easily explained. If the acari are newly hatched and kept dry, they die in a few days and crumble into dust; the same fact may also be recognised in the maggot. If the fly deposits its eggs on the wool in very dry weather a great many perish; but if the atmosphere is soft and warm they spring into life with amazing rapidity, and multiply exceedingly. As I have already said, I have never seen scab arise spontaneously; it was always communicated from sheep to sheep by the coming in contact of the sound animal with the diseased.

The following are a few of the examples that have come under my own observation:—In the back end of the year a sheep having strayed from a drove that had been bought at Falkirk, and after passing through a great many stock-farms, took up its abode on one of the farms in the high pastoral districts of Peeblesshire, and although it had been often observed by the shepherds, no particular attention was paid to it, as it is an event of frequent occurrence. In the course of a few weeks the animal

was observed to be drawing the wool off with its teeth, and when it was caught and examined, the body was found to be affected with scab to a considerable extent. The sheep was instantly destroyed, as the owner was not known. But in the course of six weeks several of the sheep belonging to the hirsel where the diseased sheep had taken up its abode showed symptoms of disease. They were instantly taken home and dressed; also, every sheep belonging to the cut or lot that grazed together, and it was considered that effectual means had been taken both as to the cure and the preventative. But in the spring of the year the disease broke out anew amongst several of the cuts or lots of the sheep in the hirsel, and, after several unsuccessful attempts, the disease could only be eradicated by dressing the whole flock, both sound and diseased.

Buying in diseased rams is often a fruitful cause of spreading the disease; and as the insect at a certain stage remains dormant, and baffles the most acute eye to detect its presence, still it retains life from autumn to spring,—a circumstance which shows that the most practical stocksman may purchase scabbed sheep unawares, of which the following is a proof. A farmer in Peeblesshire bought four Cheviot rams in the month of September, and after being brought home, rumours were whispered that scab had been prevalent amongst the stock from which they had been bred. This led to the rams being minutely examined, and no trace of scab could be recognised. They were put to serve hill ewes in the month of November, after passing another careful examination, and passed as sound. But in the course of a month two of them showed symptoms of scab; and upon examination it was found the disease had clearly manifested itself. The four rams were immediately taken in and dressed; but in the month of January several of the ewes were affected. The whole hirsel was subjected to a minute examination, and although a very few were slightly infected, the whole were dressed, and the disease at once disappeared. This shows the great importance of applying a cure as soon as the disease is observed, and of dressing every sheep that may have had an opportunity of coming in contact with the diseased ones. To illustrate this fact, I may relate the following, which occurred on a stock-farm not far distant from the last mentioned, and where scab was communicated to the ewe from buying in diseased rams, and where also no disease could be traced on the animals at the time of purchase. They were put to serve the ewes at Martinmas, and were brought in at the New-Year, and put on liberal feeding, and in the course of a few weeks the disease manifested itself. Scab broke out among the ewes by the middle of February, and those that could be recognised by sight or showed symptoms of disease only were dressed. The cure, or rather what may be termed no cure at all,

was continued in this half measure for a year, till not only the whole hirsel had become affected, but the disease was communicated to the flocks of three adjacent farms. In this case, had not a strict inquiry been made, the disease might have been said to have arisen spontaneously. This, however, was not the case, for it was clearly proven that scab had existed amongst the flock from which the rams had been bought; and at the time of sale the sheep were not thoroughly cured.

Various and conflicting opinions exist as to what extent the disease is infectious. Some affirm that it requires sheep to come in contact with the diseased before it can be communicated; whilst others maintain that the disease is propagated by the mere travelling on a road, such as a public drove-road, from large markets or fairs. I, however, do not think the disease so catching as the latter advocates affirm. For example, I have acted as shepherd for sixteen years on various farms, where the drove road from Falkirk to the south passes through the sheep pasture, and every year some of the lots of sheep were more or less affected with scab, and during all that period not a single sheep of which I had the charge caught the disease. Strict measures were always taken to prevent intermixing, but the sheep were always daily passing along, and crossing and re-crossing the road through which the scabbed droves were driven.

A stronger proof than this, that scab is not so catching as some affirm, may be deduced from a neighbouring farm, where the drove-road from Falkirk not only passes through the sheep pasture, but it is what is termed a stage from the market to the south, that is, part of the regular sheep pasture is usually let for sheep and cattle to stay all night on, and not a single sheep on the farm was ever known to catch the disease. The ground set apart for letting to droves is very high and exposed, and is free of dykes or rubbing-posts, and is eaten bare, and rendered foul by the droves; and, consequently, no inducement is left for the sheep on the farm to pasture on that particular space for a time. Nevertheless, they are daily crossing and recrossing, which, we think, is sufficient proof that the disease is not so catching as some affirm, and that it requires sheep to come in contact with the diseased animals, or a longer period of time than a single night, for the acari to be deposited on the pasture, or any projecting substance, so that it may be communicated to sound animals. I think this fact illustrates a very important point, regarding which a great discussion has arisen of late, in the Cattle Disease Prevention Bill, namely, to what extent scabbed sheep ought to be allowed to travel publicly, and I think it will appear quite clear that if scabbed sheep are driven straight on the public road, without coming in contact with sound animals, there is no danger of the disease being commu-

nicated; and it is a fact yearly experienced amongst dealers and drovers, when buying sheep in the Highlands to bring south, that although no scab can be detected amongst them at the time they are lifted, still, after a drive of several weeks, before they get to their destination, the disease frequently breaks out; and I have never heard the origin of the disease attributed to the driving, but the irritation, and sometimes overheating, only tends to rouse into action the latent germs of the disorder which manifests itself more early than if the sheep were allowed to graze at their own leisure. Then, in these cases, if a lot of sheep were stopped on their road homeward, a case of great hardship and difficulty would occur, which the most acute dealer could not avert nor foresee, and the danger of spreading the disease would be increased tenfold more, by the lot being stopped at some station than if they were allowed to pass straight on.

There is no doubt that railway travelling is a very different question, and a very fruitful source of spreading the disease. For example, if a lot of scabbed sheep were placed in a truck, and conveyed for several hours, and, when taken out, if a lot of sound ones were put immediately in, which sometimes occurs, great risk is run of catching the disorder. To illustrate this point, I will relate the following fact:—On a farm in Mid-Lothian already alluded to, where the disease prevailed to such an extent, no fences or march dykes existed between it and several of the adjoining stock-farms, and from the shepherds paying particular attention in keeping the sheep from intermixing, the disease for some years never spread to any extent; still, there was always a few catching the disorder. To obviate this, and the constant care and trouble of the shepherds, one of the adjoining tenants put a paling along the boundary on the top of the hill, between his sheep pasture and the farm where scab prevailed. Instead, however, of the fence having the desired effect, it was exactly the opposite, and the disease spread and increased to a far greater extent. The reason is plain, and can be easily explained. Sheep naturally draw to a hill top at night, if the weather is mild—consequently the paling served as a rubbing-post, where the diseased sheep naturally drew, to ease their torture, and on which the acari must have been plentifully deposited, consequently the sound sheep on the other side were attracted by their neighbours, and not only carried off the acari, but the wool of each came in contact through the bars of the paling, so that the disease was transferred from sheep to sheep. Thus, in a similar manner, scabbed sheep conveyed by the railway is a more fruitful source of infection than travelling on the open road.

Cure of scab undoubtedly lies in the destruction of the insect, but the important question is—What is the best composition or infusion for that purpose? The remedies that are commonly

applied are numerous; but the most effectual, with the least danger of injuring the animal, that ever I have seen applied, is the common spirit of tar, and, if properly applied, will penetrate and destroy the insect concealed in the pustules, or buried beneath the skin. The quantity applied may vary according to the condition and age of the sheep, but for hill or ordinary breeding stock, one bottle of the spirits of tar, mixed with twelve times the quantity of water, is sufficient for twelve sheep, or one common glass of the spirit of tar, mixed with a bottle of water, is sufficient for one. But if a large number of sheep require to be dressed, a quantity of liquid, or as much as will dress a hundred sheep, may be mixed at a time. If mixing for a hundred, six gallons of water, with six pounds of common soda, ought to be warmed to the boiling pitch, then add the spirit of tar. The soda acts as a chemical substance to combine and thoroughly mix the spirit of tar with the water—without it the spirit of tar will not intermix with water; afterwards fill up the mixture with cold water to the quantity required. The operation ought then to be conducted in the usual way of pouring, but with a great deal of more time, care, and attention. The shepherd sheds the wool, and a boy or girl with a small tin dish, in the form of a coffee or tea pot, but a great deal smaller at the outlet, measures out the exact quantity for each sheep, and pours out the liquid slowly, following up the furrow behind the shepherd's hands. The sheds ought not to be above one inch apart, so that the skin of the animal may be thoroughly examined; and wherever the scab has got into a hard crust, a blunt instrument or knife ought to be used, to scarify or scratch off scab, to enable the liquid to penetrate more easily. The shepherd ought also to have a quantity of the pure spirit of tar at hand. If the animal is badly diseased about the hind quarters, particularly about the tail or thighs, or even about the forearms, he may apply the liquid freely, and rub well in with the hand. There is little danger of injuring the animal on these parts. I have put four glasses of the pure spirit of tar on one sheep, without any injurious effects. But great caution ought to be used about the shoulder, and above the kidneys, and nothing but the mixture ought to be applied to these parts. If a sheep shows symptoms of having got an overdose by staggering a little, which it will do in the course of fifteen minutes,—if such is the case, a pitcher of cold water poured along the back and shoulder will give immediate relief, and is an effectual cure. There ought always to be two apartments for the dressed sheep. As I have already said, a cure cannot be relied on without dressing the whole flock where scab breaks out, so that when the shepherd finds the least speck of disease on any animal, he ought to put it into one apartment, and the clean, or apparently

so, into another. The latter may be turned to their former pasture when thoroughly dressed, but the scabbed ones must be kept separate for ten or fourteen days, and then undergo a second dressing, even although the disease may appear entirely subdued, as the first dressing cannot always be relied upon as an effectual cure. They may then be turned out to join the rest of the flock, and I have never known the disease break out afresh under that treatment.

I have cured two lots of hogs seriously affected with scab in the manner described. The first lot was bought from a dealer in the month of October, and after being brought home, and put on a second crop of clover, they showed symptoms of scab in two weeks, but no means were taken to arrest its progress for two months. Application was then made to the dealer to get them returned. He refused, on the ground that the application ought to have been made as soon as the disease appeared; and there was no doubt the owner made a mistake on this point, as he had allowed the whole lot of hogs, amounting to a hundred, to become affected, and a good many had lost condition. I was asked by the owner to try and effect a cure, and use any application I considered best. I consulted an old shepherd I knew had a great deal of experience amongst scabbed sheep, and he advised the above remedy, namely, spirit of tar. I dressed every hog. Those that were badly diseased I applied an extra dose of the pure spirit of tar. I instructed them to be turned into a clean pasture field for fourteen days; and although the disease at that time appeared to have been subdued, I dressed the whole lot again. The hogs were clipped during the summer, and fed on turnips in winter, and no symptom of the disease ever appeared.

The second lot of hogs was also bought from a dealer, and had been three times returned on his hand for being scabbed. The dealer asked my employer to buy them. This he agreed to do at a price much below the original cost, and on condition that every sheep that died of dressing was at his loss. They were greatly reduced in condition, and the wool was falling off in large flakes. I applied the same remedy, but I was instructed by my employer to make certain of a cure, although I killed a good many; consequently, to every hog that was badly diseased, I applied the spirit of tar liberally, putting as much as four glasses on some animals. A good many of them sickened and staggered a few minutes after being dressed. I at once applied the cold water, which was an immediate cure. After fourteen days I dressed the whole lot again, which was in the month of January; and at the term of Whitsunday, when I left, they remained quite clean, and in thriving condition. I never had an opportunity of seeing them again, but, upon inquiry, I was in-

formed they were fed off on turnips during the following winter, and no symptoms of the disease again appeared.

It will be seen, however, that these experiments were conducted upon sheep that had only been for a comparatively short time affected with scab; and, from my own experience, I cannot say how the cure would succeed with a flock of sheep where the disease had existed for years, and, consequently, the ground had become foul, and liable to communicate infection.

I take the liberty of quoting, on the authority of a friend, an experienced shepherd, who was engaged a good many years ago to superintend a large stock-farm in the Highlands, and where scab had prevailed amongst the flocks for many years previous. He states he bathed the whole flocks twice with the spirit of tar; afterwards, in the month of November, he smeared the whole heavily with the usual mixture of tar and butter, which effectually eradicated the disease. But, he adds, although the cure of scab in a large stock-farm entails a great deal of trouble and expense, it can be accomplished. But whilst stock-farmers are not all equally zealous in keeping their flocks free of scab, the great difficulty is how to prevent it. Whilst sheep are newly poured with the spirit of tar, or heavily smeared with tar and butter, there is no danger of them catching the disease from coming in contact with scabbed sheep; but it is no uncommon occurrence, and very mortifying, after your whole flock is thoroughly cleaned and clipped, for a strayed scabbed sheep to find its way among your own; and, in these mountainous, wide districts, it may have taken up its abode for weeks, or perhaps months, before it is discovered, consequently a fresh outbreak of the scab is the result.

To corroborate this statement, Mr Gardner states his experience in curing scab in Australia. When he first went out and commenced stock farming, scab prevailed almost generally throughout the colony, and it was the greatest pest and difficulty sheep masters had to contend with. No sooner had he got his flock cured, than they caught the disease afresh, from coming in contact with some more indolent neighbour, who allowed his flock to be overrun with scab. At length stringent laws were passed, inflicting a heavy penalty on every stock-master who allowed his sheep, if scabbed, to come within a mile of his neighbour's boundary. Mr Gardner then saw there was a possibility of eradicating the disease. His flock at that time amounted to upwards of 10,000, and the disease was spread throughout the whole, which was certainly a very formidable task to attempt to cure. Clipping time was the period selected for the operation. After every sheep was stripped of its wool, three men were appointed for each sheep, which was thoroughly dressed with an infusion of tobacco and sublimate

of mercury. All the sheep that showed the least symptom of disease were kept apart by themselves, and underwent a second dressing in a few weeks. In the course of six months the whole flock was clipped a second time, a system which was practised in some of the districts of Australia at that time—clipping twice in the year. Mr Gardner dressed his whole stock again, putting them through the same process; and whilst he resided in the colony, which was for several years, a scabbed sheep never was seen amongst his flock,—a very important fact, and a demonstrative proof that scab amongst sheep can be totally eradicated, even although it has been of several years' standing. "Thus," says Mr Gardner, "in the course of six months, after a great deal of trouble and expense, I got rid of the most troublesome disease that can affect sheep. But the trouble and expense were doubly repaid in the same space of time. The stock fed a great deal better, and the wool was of more value; and instead of being compelled to pay a shepherd for every 600 sheep, to keep scab in moderation, I put under one man's charge 1600 sheep, and found he could manage the latter number with more ease and satisfaction than he could formerly the 600 when scab prevailed; and I was enabled to live, myself, in comparative ease and quietness. The quantity of liquid applied was one ounce of the sublimate of mercury, mixed in two gallons of water, and a few ounces of tobacco boiled, which was sufficient for twelve sheep." Mr Gardner adds that the mixture was attended with a good deal of danger, and, in general, a good many died after the operation, especially if allowed free access to water. They drank greedily in that hot climate, and doubly so after the operation; and when allowed to do so, a severe swelling took place about the head, and death was generally the result. But when the operation was conducted with care, and the sheep kept entirely free from water, the loss was trifling.

The loss resulting from dressing scabbed sheep with the sublimate of mercury in Scotland has at times been severe, and has led generally to the disuse of it. There is no doubt a more powerful substance cannot be used for destroying the insect, but it is often attended with injurious results to the constitution of the animal. And there is no doubt the spirit of tar is a safer and equally as effectual a cure. The only objection to its use is staining the wool, and a good reduction of price is sometimes experienced at the time of sale. This, however, is certainly the least evil, and can be remedied to a great extent; for example, if a flock of sheep has to be poured twice with the spirit of tar, there is no doubt the wool cannot be sold at a high figure for white, but, again, let the sheep be smeared with tar and butter, and sold for laid wool. The extra weight in a great measure

counterbalances for the high price obtained for white wool; and the smearing serves a double purpose—it acts as a safe and an effectual cure for scab, where the disease has been of long standing, if the sheep have been dressed with the spirit of tar previously. Indeed, some men of great experience maintain that a mixture of tar and butter, properly laid on sheep, will effect a cure of scab in sheep in whatever stage of the disease. And I am informed by a large English dealer and grazier, who has bought annually for the last twenty years at Falkirk from fifty to eighty score of sheep, that during that period, with the exception of one year, scab always broke out on the way, or shortly after his arrival home, and the only cure he applies is smearing with tar and butter, and he never has had to apply the cure twice to the same animal; but he adds, the great secret of success lies in the shepherd or operator paying attention that no part of the animal is missed. Fifteen sheep per day is all that the most proficient hand can accomplish. Thus, we think, it will appear clear, when scab has existed for any length of time, smearing with tar and butter is an essential application after dressing with the spirit of tar.

As I have already said, I have never seen nor known the disease break out spontaneously amongst sheep; and I am firmly impressed with the idea that, if cases do occur, it is the result of bad management, such as overcrowding, overheating, or the want of bathing annually, especially the latter. For example, about thirty years ago, when smearing with tar and butter was the general practice, it was the common belief that sheep would not live during the winter without being smeared once a-year, at least they were certain to become scabbed. So prevalent was this idea, that when an enterprising stock-farmer in Peeblesshire commenced pouring his flock with an infusion of arsenic and water, to obtain a higher price for his wool, he was looked upon by his neighbours with dread, as they considered he was certain to produce scab in his flock, whereby they were sure to catch the disorder. After a successful trial of some years, almost every stock-farmer followed his example, and some ran to the opposite extreme, and kept their sheep in a natural state, without applying any composition whatever; but the vermin, such as tick, kade, and lice, increased to such an extent that a kind of itch or scales appeared on the skin, which prevented the sheep from thriving, and the owners were compelled to have recourse to some kind of composition to pour or dip their flocks with annually. Although the itch or scales could not be termed scab, still, if their flocks had been allowed to run "white," as it is termed, for years, the result might have terminated in scab; and there is no doubt that bathing or dipping once a-year with some kind of composition is a safe preventative.

The great drawback in dipping compositions is the poisonous

ingredients they are composed of, and many practical stock-owners consider they weaken the constitution; other stuffs can, however, be obtained free of poison, and equally as good for destroying vermin. Mr Gardner, Traquair Knowe, has been in the habit for many years of bathing his sheep annually with a mixture of rough turpentine and butter, and has found it more effectual in destroying the vermin than any of the common dipping mixtures in use, and being of an adhesive nature, it mats the wool together, which tends to keep the animal warm, and has no injurious effect whatever, but, on the contrary, it promotes the growth and quality of the wool. In proof of this, Mr Gardner has been in the habit for some years of sending his wool to the Leith sales, and for three years it brought the highest price for white Cheviot wool.

Although it is a point generally conceded by practical stock-owners that scab will not break out spontaneously in sheep if properly managed, still it is equally as clear that scab abounds in certain districts. Thus an important question arises, How is it to be prevented from spreading? for whilst no law exists to compel negligent stock-farmers to clean their sheep, it is clear that the most careful and cautious run great risk of their stock catching the disease, especially those that buy largely at market. So much is this the case, that I am informed by a large stock-farmer and dealer of thirty years' experience, who is in the habit of buying annually at Falkirk, that for many years scab always broke out amongst some of the lots he purchased after they were brought home, and even spread amongst his home-bred stock by coming in contact with each other. To prevent this evil, he has been in the habit in latter years of pouring every sheep he purchased at Falkirk with the spirit of tar immediately on their arrival home, and every sheep that shows the least symptom of disease is kept apart and receives a second dressing. Thus, although a great deal of trouble and expense is incurred, it is the only sure preventative for the disease spreading. Although this is a successful preventative in bought-in stock, a more difficult point presents itself; for example, scab is allowed to prevail amongst a flock of sheep in some of the pastoral districts where there are no march fences, and where the flocks on various farms are daily intermixing, In such cases it is a matter of impossibility to prevent scab from spreading, and the only remedy is to get a law to compel the owner of the diseased sheep to get them cured, or to keep them apart from neighbouring healthy stocks under a severe penalty. If some stock-farmers are so careless and negligent as to allow their stocks to be overrun with scab, there is no reason they should be allowed to bring trouble and expense on their neighbours; and until some stringent law of this nature is passed scab will never be totally eradicated from amongst our sheep.

But if stock-farmers and graziers were all alike anxious to get clear of the disease, and apply the proper cure, it might be eradicated from amongst the flocks of Great Britain in twelve months.

THE ISLE OF MAN—ITS AGRICULTURE, CLIMATE, ETC.

By John Honeyman, Crosby, Isle of Man.

[*Premium—The Medium Gold Medal.*]

The Isle of Man is situated in the Irish Sea, at about equal distance from England, Scotland, and Ireland. Its nearest point from England is St Beeshead, Cumberland, about 30 miles east; from Scotland, Burrowhead, 16 miles north; and from Ireland, Strangford, 27 miles east. The distance from Douglas to Liverpool, 60 miles; from Ramsay to Whitehaven, 28 miles; from Mull of Galloway, 21 miles; Belfast, 38 miles; and from Holyhead, 45 miles. The centre of the isle is 54° 16′ north latitude, and 4° 30′ west longitude. Its length from north-east to south-west is about 30 miles, and its greatest breadth about 12½ miles. Its circumference is about 75 miles, embracing an area of 209 square miles, or about 145,000 statute acres; of these 30,000 are occupied by bare and bleak mountains and commons. Its population is upwards of 52,000.

For civil purposes the island is divided into two districts, northern and southern. Each district contains three sheadings, of which Ayre, Garff, and Michael are the northern, and Rushen Middle and Glenfaba the southern districts. Each sheading comprises six parishes, except Garff, which has only five; there are thus seventeen parishes in the island altogether. In ecclesiastical affairs, the isle constitutes a diocese, under the jurisdiction of a bishop, an archdeacon, a vicar-general, and an episcopal registrar. The see is in the province of York, and in the patronage of the Crown.

The island is long and narrow. On approaching it, its appearance is rugged, bold, and mountainous. A chain of hills running from south-west to north-east, a distance of twenty miles, divides it north and south. Considering the small extent of country, the hills are high,—the highest, Snafell, is over 2000 feet above the level of the sea; and in clear weather, from its top may be seen the shores of England, Scotland, Ireland, and Wales. This chain of hills, running west beyond the town of Peel, terminates in a precipice overhanging the sea; the mountains are for the most part rounded, and are covered with turf and heather to their very summits. The inhabitants for ages have carried away the surface soil and used it as fuel, which has materially injured the pasture; even the heather is short and stunted, and sheep do not

eat it as they do the heather on the hills of Scotland. The mountains are chiefly composed of grey wacke, clay-slate, and schistone; towards the south of the island, considerable portions of granite contain silvery mica, grey quartz, and felspar, both red and white. From each of these mountains there are several streams, but little advantage is taken of them for agricultural purposes. Lead is found nearly all over the island, and advantage is taken of the rivers in propelling the machinery required for crushing and preparing the lead ore for market.

The island is divided for the most part into small properties, which have been handed down from generation to generation. These proprietors generally farm their own land, and intermarry one with another. Their sons at an early age go to the herring fishing during the spring and summer months, and when herrings are plentiful, they live idle during the winter, doing nothing but smoking tobacco during the whole day. Should the season be unsuccessful, they are obliged to work at any farm work they can find during the winter; are mostly indifferent workmen, and accept of low wages. The girls are cleanly and industrious; but many farmers' daughters, with large holdings, can neither read nor write. Upon the death of the father, the eldest son gets the inheritance, which requires to be burdened to pay off the other members of the family their patrimony. The small estate having thus been burdened over and over again, there may be little inheritance left for the new proprietor. Being thus poorly left, he struggles on in the old premises, which are composed of a row of houses, or even worse, a house planted here and there, the walls of which are built of stones and mud, pointed on the outside with lime. The roof is made of two or three couples placed about 8 feet apart, with rough branches placed across, about 10 inches apart; upon this a thin divot or sod, about 3 feet broad, and 8 to 12 feet in length, is placed upon the top of the branches; it is then thatched and roped in the form of a corn stalk. This requires to be done every year, as the straw rope soon decays, and it must be renewed in order to keep on the straw. The dwelling-house and out-houses are generally of the same description. The dung from the byres and stables is thrown to the door in a heap. If the place is high, the urine is allowed to run away where it best can; and if the dung-stead happens to be in a hole, it is left to soak until it is required.

The men-servants are engaged at Holintide. Married men are engaged by the year, at so much weekly wages, averaging about 10s. per week. In addition to the money, they have a free house, and from two to three bushels of potatoes planted, they providing the seed, the master the ground and manure. They get their coals driven free from the nearest shipping port, for which they have to pay at the ship's side (as there is no coal upon the island).

As a rule, they are in the stable by sharp six o'clock in the morning, when they feed and clean their horses, and return home to breakfast; the horses are turned out to work about half-past seven o'clock, returning at twelve noon, when the men go to dinner, and turn out again at half-past one, when they go on until six in the evening. Manx ploughmen are, in general, adepts at the plough, and will make good work, ploughing lea across a hill that Scotch ploughmen would not think of attempting. During harvest they commence to work the same as throughout the year, and when drawing home corn, whatever the weather may be, they unyoke their horses and put them in the stable for an hour and a half, and drop the day's work at six P.M. We cannot blame the men for this, but the masters. Were they to be allowed a drink and a little extra food during harvest, there is no doubt they would work from early morning until gloaming grey. Take Manx ploughmen from their horses and place them at any other farm work, two ordinary Scotchmen will work more than any three of them, as they are not fed to stand the roughing of a Scotchman; at scythe-work, in particular, they fall far short. As regards quantity, an imperial acre of oats is a good day's work.

Young men are engaged by the year. Their average wage is about L.13 sterling, with their meat in the farmer's kitchen, sleeping either in the farmhouse or some one adjacent. They thus sit at the kitchen fire along with the family and female servants, and as one-fourth of them can neither read nor write, it may easily be imagined what their conversation will be. These young men get oatmeal porridge and milk in the morning, with herrings and bread after, or bread, butter, and cheese. On three days in the week, during winter, they have broth and meat; the alternate days they have herrings and potatoes for dinner; in the evening, the supper varies. Married men live mostly upon tea, barley bread, and herrings. It is quite the exception to see a married man feed a pig, consequently butcher meat is seldom at his table. Receiving his wages every Saturday evening, he deals at some small grocer's shop in the village, where he receives an inferior article, and for which he pays the highest price. With oats at 20s. per boll, barley at 30s., and wheat verging upon 40s. per boll, the wonder is how a man with a small family can live upon 10s. per week; it therefore does not surprise us that he is not fit to perform a good day's labour. Manxmen, in general, are bad grooms of their horses; they do not take sufficient time in the morning, and in the evening they are in too great a hurry to get home. Their state of morality is much worse than that of Scotland. The cottage consists of one cooking and one sleeping apartment; there is thus no separation of the sexes. Few of their children go to school;

as whenever they are able to work in the fields, they are but too glad to send them out; they thus grow up in ignorance. Many of the parishes are large, and the parochial school may be at some distance, which no doubt operates against their instruction.

The parsons of the different parishes do not pay much attention to the instruction of the people. Ploughmen in general seldom attend any place of worship, although the same cannot be said of their wives. Parish churches are very indifferently filled. The Wesleyan Methodists have established a good footing on the island; they have several commodious chapels in every parish, and preaching is supplied by what are termed local preachers, who are planned to preach a day here and another there, so that you do not hear the same preacher two consecutive Sundays. Some of these preachers are well read in Scripture, and from such you can get a tolerably fair discourse; from others you receive no edification. Many of the rural labourers make a hobby of Methodism; and although they can neither read nor write, they will pray in public with great fluency.

A large portion of the inhabitants are employed at the various lead mines throughout the island. Foxdale Mine, in the parish of Patrick, employs several hundred miners; they are paid so much per fathom, or so much per ton of lead ore, after it is washed. They generally make good wages; and they work from seven to eight hours per day. They work in gangs of four together, and can make from 4s. to 6s. per day, clearing all expenses. At Laxey, in the parish of Lonan, there is another extensive lead mine, which has been worked for upwards of forty years. During this period they have produced upwards of three-quarters of a million sterling worth of ore, consisting of zinc and lead. The present monthly produce is between 60 and 70 tons of ore, containing about three ounces of silver to the ton; about 300 tons of zinc ore, of about forty-five per cent.; and upwards of 200 tons of copper ore, of from six to seven per cent. The mine is between 200 and 300 fathoms in depth. The machinery for preparing these different metals is all driven by water, and is considered the most extensive and efficient of the kind in existence. It requires six water-wheels to propel this machinery, besides two powerful turbines; the latter are used for the purpose of drawing the produce out of the mines. Besides these, there is an overshot wheel, supposed to be the largest water-wheel in Her Majesty's dominions; it is over 200 horse power, and is supported by a substantial structure of masonry. Though properly an overshot, it moves in an opposite direction to the stream of water. The following are its dimensions:—Diameter, 72 feet 6 inches; circumference, 217 feet 6 inches; breadth of

wheel, 6 feet; length of shaft, of malleable or wrought iron, 17 feet; diameter, 21 inches; weight, 10 tons; makes two revolutions per minute, and can be increased to four and a-half. Two revolutions per minute keeps the mine clear of water. It pumps, from a depth of 400 yards, 250 gallons per minute, which can be materially increased if required. There are upwards of 400 men employed under ground, and 200 men above ground.

A search was made for coal during the spring and summer of 1867, but without any success. Several companies have started in various directions throughout the island in search of slate and flag metal, but with very little success; one company alone having spent upwards of L.50,000, and did not realise L.100 worth of metal.

The climate of the island is much more mild, uniform, and equal throughout the year than any of the neighbouring coasts, nevertheless, it is very moist. From a carefully kept register, during the year 1867, we find that less or more rain fell during some period of the twenty-four hours upon 254 days, and 78 days throughout the year were actually dry, and 33 frost with snow; and mist is seldom off the mountain tops. Only on 19 days during the year was the mist not observed upon them, which is materially against the value of their pasture for sheep. The climate varies more in a short distance on the island than it does from the city of Edinburgh to the Castletown of Braemar. The mean annual temperature is, however, higher than any place in Europe. Frost or snow are always slight and of short duration. Gales of wind are very frequent; and there is a want of sunshine and sufficient heat during the summer to produce a good sample of wheat.

There is a great variety of soil. In the northern districts it is sandy, resting upon clay or marl; the clay is seldom more than two feet from the surface. Clay is frequently used to top-dress the light land, to give it consistency to produce wheat. In this district there is a large tract of land called Curragh, hundreds of acres of which are still unimproved, with every access at command for drainage. Along the centre it is poor soil, and it has been very appropriately termed the backbone of the island. Here the land is thin, and where it is wet is of the worst description, even when drained artificially; but if of a dry bottom naturally, and in fair condition, it yields Swedish turnips in large quantity at an elevation where it would be useless to sow them in Scotland, but their quality is inferior. Towards the south the soil rests upon limestone; it is chiefly loam, though clay prevails in some parts, and in some places it is sandy. Lime of good quality is wrought in abundance, and driven for agricultural purposes over the whole island; it is sold cheap. Manxmen give to their land very small doses of lime at a time, from ten to twelve barrels per

acre, or at the rate of three to four cart-loads at most. Limestone is found very near the surface. Towards Castletown it crops out upon the surface for a considerable distance along the sea shore. The land in this district is of good quality, and lets at from L.3 to L.5 per acre. There are also large quantities of sea ware driven in upon the southern coast; hundreds of carts may be seen loading of a morning if the wind is of a westerly or south-west direction. Every farmer in the district takes advantage of it, which materially adds to the produce of the land. This is the best farmed portion of the island; and where the land is not naturally dry, it has been made so artificially. The farmers here generally manage to clean a portion of their land intended for green crop immediately after harvest. This they ridge up for potatoes, and leave it in this way during the winter; it is thus ready to receive the sea ware, come when it may. It is drawn direct from the shore on to the land, placed in the ridges at the rate of from thirty to fifty loads an acre, is spread into the ridges, and left in this way until the potatoes are planted. On the west and north shores very little ware is to be had, except occasionally; and that which is driven ashore is small and weedy compared with that of the south. Large quantities are occasionally found in Douglas Bay.

The rotation of cropping generally followed is the five course shift, viz., first year grass, always cut for hay; the average produce does not exceed one and a-half ton per acre. There is no second crop capable of being cut for soiling or otherwise, and it is eaten by sheep or cattle. The second crop is pastured. The third is for the most part ploughed for oats; but in the north, from the repeated marling of the land, oats do not succeed well, and wheat, without any manure whatever, is sown after the lea land. A top-dressing of marl or clay is usually applied about or after harvest. The third crop is potatoes or turnips. The stubble is ploughed as soon after harvest as circumstances will permit. This they plough as roughly as possible, when it is left for the winter; gets no second ploughing; the grubber is drawn once through it; no matter what quantity of dirt, it is seldom taken out, but ridged by the single plough. The green crop is then put in in the spring. The whole crop is drawn to the yard, and barley or oats is then sown.

As I have already observed, the first year's grass crop is cut for hay. This they generally sell before harvest to the stable keepers in the different towns, and, on an average of years, the price is from 50s. to 60s. per ton. The second crop of grass, which is generally very scanty, is eaten by the milch cows, or by ewes that may have had late lambs. The third year the grass is broken up, and as the land for the most part is very steep, they in general plough the lea across the face of the hill, and it is surprising how they make so good workmanship. On

no occasion is the land ploughed up and down hill; the ploughing is light and narrow. In spring, when they have light for a day of ten hours, few, if any of them, can accomplish the ploughing of an imperial acre. After harvest, when all the herbage has been eaten by the keeping sheep so bare that it is a matter of surprise how they can exist, the stubble is then ploughed to remain for the winter. This they do in narrow stitches. In February they generally commence to plant potatoes, but if the land is very wet, it is deferred until March. Seldom or never do they stir the land; it is well harrowed and grubbed across, then upon the angle, and well harrowed afterwards. It matters not if the land is dirty or clean, if they can ridge it, it is sufficient. This they always do with the common plough; in fact they could not get a double mould-board plough to go through it, as the land is not made sufficiently loose for that purpose. They never draw the ridges (drills) up and down hill; it is always upon the angle, making a rib down hill, and covering the dung or artificial manure up hill upon large holdings. Any number of ploughs can proceed at the same time. In this way the turnips are then sown; and so dirty is the land, that the drill harrow works with difficulty when the turnips come up, from the quantity of couch-grass left, and growing between the drills. It is quite common to sow turnips, the winter furrow being scarcely broken, and if well manured, it is surprising to see what fine turnips grow. The singling of the crop is all done by the hand. They have never been accustomed to use the hoe, and cannot do it. The women employed upon the farm are paid at the rate of 8d. to 9d. per day of ten hours; but, like the ploughmen, a well trained country Scotch girl would do more work than any two of them. When extra hands are required, they have to be sent for from the nearest town, and driven home at night, if the distance is over two miles. For the most part they are inferior workers, and they get 1s. per day, with no certain number of hours. There is no attempt made to clean the land during the raising of the turnip crop, with the exception of what dirt may be drawn out by the drill harrow.

The crop of turnips is in most instances wholly removed from the ground, the tops and bottoms being left. As soon as a field is cleared, the young cattle and sheep are turned into it, to pick up whatever is left; and so long as a vestige of green food of any description is left they are kept there. The following crop is barley or oats, as the case may be. When barley, it is usually not sown until it is what they term between the two Mays. The consequence of this practice is that they never grow a good sample, and the natural weight is always light. Oats are grown all over the island, and are of ordinary quality. All land is sown

with grass seeds after green crop. A few farmers (Scots) consume a portion of the turnip crop with sheep; but this is the exception, by no means the rule.

Every farm, whether large or small, is sub-divided and enclosed. This has been done in the days of old, and it would be a matter of difficulty to make them as crooked as they are, were the present generation to try it. This was done, they say, so as to afford shelter in some of the corners, whatever way the wind might blow. These fences are all made feal dykes, that is, of divots taken from the surface, and filled with soil between. These were made from six to eight feet in width at the bottom, and about two and one half at the top, with a ditch upon either side. The top is sown with whins, but many of the old fences are so wide, that you may easily drive a horse and cart upon the top of them. So fond are the Manx of such fences, that they are building them of the same material at the present day, although plenty of stones could be conveniently got. It will thus be seen that from four to five yards are lost with such a fence, and about three or four yards more on either side are robbed by the surface being taken for its erection, besides, it is continually requiring repairs, and, at best, it is a very bad substitute for a fence. So accustomed are the sheep to them when they are loose, that they make a run in a slanting direction, and are over the top in a moment, although they are generally from five to six feet high. They are in consequence obliged to tie their sheep with what is termed a lanket. This is made of menella, three ply thick, with a loop upon each end, and about one foot long (according to the size of the sheep). A running noose is formed upon each end, and a fore and hind leg placed in the loop, which prevents them from leaping. When walking, they form a step, and then a half one as they proceed; and, if pursued, they hold up the hind leg, and run swiftly upon the three. Many of them even go over the fences although thus tied.

There is a breed of sheep said to belong to the island; and I am inclined to believe it, as no other agricultural community would think it worth the trouble to rear them. They are from six to eight pounds per quarter when fat, but their mutton is superior to the Scotch Black-faced. The ewes are excellent mothers, evidently giving a large quantity of milk, as the lambs, when fat, produce the largest quantity of fat upon the kidney of any we ever saw slaughtered, and the meat is of excellent quality. When the lambs are fat they are heavier (per carcass) than they ever are if kept on for breeding. In former times the mountains were commons, and every inhabitant could send as many sheep as he chose to be grazed upon them. This was taken advantage of, and they generally had as many sheep as would yield wool to keep the family in clothing of every description. The wool was

spun at home, and wrought into cloth by some country weavers. They managed to sell a few sheep yearly, which kept them in little necessaries during the winter.

The Crown has taken the greater part of this privilege from them, and sold these lands, and expended a portion of the money in improving and making new roads throughout the mountains. A small proportion is still retained for the use of the inhabitants, and a rent is charged for the pasture.

The whole grain crop is cut either by means of the scythe, or small reaping machine. The scythe is most usually employed, and whole fields are cut and left in the swaith for several days, in order to win it. In wet seasons it often happens that it lies until it is growing to the ground. In three or four days, if the weather is favourable, all hands are sent to tie and stook it up. Neither men nor women receive any victuals during harvest. The men are paid 12s. per week, and the women 9s. They are usually employed wet and dry during harvest, at drawing straw for thatch, making ropes, &c. The stacks are made long, in the form of hay-stacks in Scotland. Round ones are seldom erected, and when they are, they have no idea of putting an opening in the centre, by means of the old Scots three legged kiln. During the lifting of potatoes the women get 9d. per day, but if sent for from the town, 1s. per day has to be paid them.

The old-fashioned flail is still in operation on many of the small holdings, but where farms are of two or three pairs of horses, the old mole mill with a long bar is in general use. One company has three or four travelling steam mills at work, and they are generally well employed during the winter season. In the dressing of the grain they have no hand riddles; the grain, in consequence, is very badly prepared for market, and would not pass elsewhere as dressed at all; the whole is sold by the boll. Wheat is weighed to 256 lb.; barley, to 366 lb.; oats, 252 lb. There is no measure of any kind. Potatoes, 4 cwts. per boll. We have never seen grain for sale that would come up to the weight by several pounds per bushel.

Their system of disposing of their produce is worthy of remark. When they have grain for sale they proceed to Douglas market, which is held upon Saturday; and if they wish to find a merchant, they must look for him in the public-house, or go to the mill in search of the miller, or to the stables of the horse hirer. There is no regular market for the sale of farm produce. In the market of Douglas every Saturday, the butchers throughout the country bring their meat to the town in carts, and they, along with the butchers in town, erect stalls in the market-place for the sale of beef, mutton, &c. The farmers send carts of potatoes in the same way; these they sell at so much per stone. There is also a green and fish market held at the same place. The wives or daughters

of the farmers stand in the open market (on the street) and sell their eggs, butter, and poultry in the same way; and during the summer, when visitors are in the island, large prices are demanded, and often obtained.

The cattle are of no precise breed, although two or three spirited farmers have lately imported pure bred Short-horned bulls so as to improve the breed; but Manxmen would rather send their cows to some mongrel, no matter what the breed, if he was one or two shillings cheaper for his service, than the best Short-horned bull England could produce. The consequence is, that the breed of cattle is so much mixed up with Irish, which are imported in considerable numbers, that the breed is small, and of little value. The cattle are sold to the butcher just when they are commenced to grow, and would pay more for the next two or three months keep than they did for the six preceding,—in truth, they never saw really fat cattle in their lives.

The horses are exceeding small for farm work, yet they are wiry, and stand a large amount of fatigue. They are mere ponies, compared to farm-horses in general use in Scotland. The same may be said in regard to breeding horses as we have said of cattle.

REPORT ON LARCH FORESTS.

By C. Y. Michie, Forester, Cullen House, Cullen.

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In this paper it is not presumed that anything expressly new will be made to appear, and yet the writer contemplates setting forth several statements, the results of considerable research and much experience, which he has found as a compass in guiding him in his own operations in the culture of larch, and concludes they will be equally useful and profitable to others.

In order fully to ascertain the circumstances under which larch grows well, it is important to have seen it upon every variety of soil, situated at various altitudes, differently exposed, subjected to varied climatical influences, and extended over the whole area of the country.

All that is considered truly essential to show how larch has been, and is still, grown successfully, and as a highly remunerative crop,—how its failure, when it occurs, is produced, and how it is to be avoided, will, the writer trusts, be fully and clearly shown in this report.

The same laws which influenced the larch for good or for evil a century ago continue to do so still. It was equally liable to

all known diseases when first introduced into this country as it is at the present time.

Larch, under similar circumstances, continues to thrive at the present day equally as well as it did on its first introduction, and there is abundance of trees recently planted throughout the whole area of Scotland (or, it may be said, Britain), the growth of which will bear a favourable comparison with those planted a century ago. However, it must be admitted that the proportion of diseased larches at the present day far outnumbers those of any other period, and is greatly in excess of trees in a state of health and soundness. To explain or account for this, requires only a consideration of the great number of trees now planted, compared with what was formerly done, the inferior descriptions of soil now planted, and the unnatural treatment it frequently meets with at all stages of growth.

The common white larch (*Larix Europea*) belongs to *Monacea Monodelphia* of the Linean system, and to the fir division of the natural order *Coniferæ*. It bears a strong resemblance to the cedars generally, but particularly in having its leaves single upon the young shoots, but always fasciculated upon the old twigs, with the embryo bud containing next year's leaves in the centre of the fasicle. It differs also in another respect from the firs and pines in having its stigma semi-globular, cupped, and glandular; and in another still more obvious manner, in being deciduous.

The cones of the larch, like those of the cedar, grow upright upon the branches, but are very much smaller in size. According to some writers, the name larch is derived from the Celtic word "lar," fat, in allusion to the resinous juice which it exudes. The Gaelic of larch is "learag," said to be derived from the Latin larix, and it is not improbable that the English "larch" was derived from the same source. Its male catkins are stalkless, and irregularly distributed amongst the female ones, the former being much more numerous than the latter, some trees being quite covered with stameniferous catkins, while scarcely a pistiliferous one is to be seen; and on some trees there are abundance of female catkins, and scarcely a male one appears.

The male catkins are a pale yellow, sometimes darker and sometimes lighter in colour. The female catkins or cones (in embryo) vary greatly in colour, from a deep crimson or scarlet to pure white or pink. The prevailing colour is a bright red, seldom scarlet, and as seldom pure white. The colour of the flowers often differs on opposite sides of the tree. They are always darkest on the south side, and where fully exposed to the sun.

In size as well as in colour the flowers vary greatly; they are always largest upon young, healthy trees, and the cones corres-

pondingly large. On old trees,—at least such as are in decay from general weakness,—female catkins are most abundant, and cones correspondingly numerous.

It is principally native to the southern regions of central Europe, and some districts of the north of Asia. It is met with pretty generally all over the Swiss and Tyrolese mountainous districts. The Alps are said to be the most abundantly productive of larch, and next to these the Tyrolese mountains, the Carpathian mountains, Hungary, and in Italy. In the north and east of France larch grows abundantly, but is not met with in Spain, Portugal, or Germany.

The Tyrolese larch are by some considered of faster growth than those of the Swiss Alps; but this difference of growth, so far as can be perfectly ascertained, is confined to the plants in their early stages. The Tyrolese larch, from its more eastern position, and the superior quality of seed, comes earlier into leaf than that of Switzerland, or from the same latitude in France.

From what we know of the growth of trees, we are led to believe that they sometimes do equally as well in countries to which they are transported as they do in their native place. The ash and the sycamore are not considered natives of Britain, and yet both trees flourish well there. Nor are we to conclude respecting the larch, that because it grows well upon the slopes of the Alps and Tyrol, that it will *only* thrive there, or under circumstances precisely similar in this or other countries.

An opinion commonly prevails that since the larch in foreign countries is invariably associated with mountains, as the Alps, the Tyrol, and others, it must of necessity have for its successful growth a sloping bank and high elevation. Those who have travelled in larch-growing countries tell us that equally good timber is grown upon flat as upon sloping ground, provided only the soil is dry and open. Local observation corroborates this statement, since it is obvious that the largest and best grown trees in Britain are upon flat but dry ground.

Passing from the geographical to the geological, we observe that the larch best thrives in a loose and dry soil, where the earthy particles are finely divided.

The quality of soil (rich or poor) affects the growth of larch little compared with other conditions, as *dryness, looseness,* and *temperature.*

The Alps are composed of granite, gneiss, mica-slate, and other rocks, but where other formations occur, such as sandstone and limestone, larch disappears.

Upon the Alps and in Tyrol, larch grows at an altitude much higher than the loftiest mountains in Scotland. Large trees are found on the Alps at 5000 feet altitude, but, generally speaking, the trees diminish in size at an altitude exceeding 4000 feet.

Botanically, we have described the varied colour of flowers, proportions of male and female catkins, size and quality of flowers and fruit; any of these, however, are too unimportant to determine the quality and condition of larch timber, or to mark the source of its disease.

The geographical boundaries of the larch-growing countries are not easily defined. The eastern provinces of France, Switzerland, the north of Italy, Tyrol, and Baden, are considered the principal larch-growing countries; but it is also mentioned as growing in Asia, and several other countries as well, all going to prove that it is a tree adapted to different localities, and might therefore grow in many countries into which it has not yet been introduced.

Much importance is attached by some writers to the circumstance of larch growing upon sloping, precipitous, or rocky ground. The accounts of this by travellers are somewhat conflicting. While some say the largest and best trees are upon the slope, others say they are best upon table land.

Larch is less choice of climate than it is of soil, and yet a low temperature at certain seasons is inimical to its growth.

From the circumstance of the larch being a deciduous tree, its foliage suffers nothing in winter; and should a severe frost occur either late in spring or early in autumn, the tree, if otherwise healthy, though frost-bitten, will in time recover, with few exceptions, though much retarded in growth.

The larch, when it has matured its wood in autumn, may be considered safe from the severest winter frosts; it dreads no weather in its normal state. In spring, however, the case is widely different, and where the trees are situated in a sheltered valley, they come early into leaf; and unless abundantly clothed with branches, and otherwise in good health, they are certain to suffer severely from frost; and a repetition of such frost before the tree has fully recovered will in all likelihood prove fatal.

In valleys where the soil is damp, and water *stagnant*, frost is most destructive to larch; but where a rapid flowing stream occurs, or a river flows, frost is thereby dispelled—hence larch will succeed well, soil and other circumstances being favourable.

While the temperature of the atmosphere of this country generally, and those formerly named, is such as to favour the growth of the larch, it is vastly different with regard to the temperature of the soil. No tree with which the writer is acquainted is so easily injured as the larch, when planted in soil of a low temperature. What the temperature of the soil is at which the tree perishes is probably unknown.

Two examples may be adduced to establish the above statement. In 1862–63 the writer superintended the planting of 500,000 larch plants interspersed amongst Scots pines, upon a hill

in the county of Morayshire. Part of the planting was performed in November, and part in February and March the following spring. The south side of the hill and north side were planted alternately, as the weather allowed. The same stock of plants were planted throughout, and the same persons performed the work of planting. The altitude on both sides of the hill thus planted was the same—between 800 and 1200 feet. The soil was pretty nearly of equal quality, save that upon the north side, which was rather deeper and richer, and of a light, mossy, and sandy loam, varying in depth from two inches to two feet, and resting upon granite rock. On the north side of the hill, owing to the extra depth of soil, the herbage, consisting principally of heath and cranberry, was more rank than upon the opposite side; but as the herbage was cut in the act of planting, no injurious results could arise from that circumstance.

On the south side of the hill scarcely one per cent. of the plants died; whereas upon the north side, on examining the plantation four months subsequent to planting, fully 75 per cent. of the plants were found to have perished. The writer at the time being quite at a loss to account for the circumstance, invited several intelligent men to inspect the plantation, in order to explain the cause of failure. Some suggested one cause, and some another, but all opinions were conflicting and unsatisfactory. The cause of failure suggested itself in the following manner:—Two small but separate enclosures were planted with the same sample of plants as those that perished, and about the same time—the one exposed to the south, the other inclining to the north. Those plants in the southern exposure all succeeded well, while those on the north almost entirely failed. Since the same sample of plants succeeded when exposed to the south, and failed when exposed to the north, the soil, manner of planting, &c., in both cases being alike, led to the conclusion that the low temperature of the soil was the cause of failure. The early part of the season, after planting, being cold and wet, probably contributed in producing the above effects.

The other example was as follows:—A nurseryman in Aberdeen, in the autumn of 1866, planted out into the usual lines in his nursery grounds several thousands of two-year old seedling larch, from beds in his own nursery; but owing to unfavourable weather, and other work requiring to be done, further planting out was postponed till the month of March 1867. The weather during several weeks after the planting was finished continued cold and wet, hence a low temperature of the soil was produced. Of those planted in autumn scarcely 1 per cent. died: of those planted in March fully three-fourths perished. On consulting with the nurseryman, who is a man of scientific knowledge, he stated that he considered the failure was due either to what is

termed "sweating in the bed" (a form of wet rot), or a low temperature in the soil for a time after removal.

The writer planted a row of larch in deep, rich black garden loam, in March of the present year, and at the time he writes 30 per cent. are dead. The soil is rich with manure, but cold and damp. Only a few yards distant another row was planted at the same time, of the same sample of plants, upon light loam, rather poor, but warm; and these are all growing well, no deaths having occurred.

The circumstance of larch plants perishing by being planted either at a time when the temperature of the soil is at its lowest point,—at a season of the year when the plants remain long in the soil before vegetation takes place,—is not peculiar to larch alone, but is observed also, though to a less extent, with many other species of trees.

As the success or failure of larch planting depends so much upon the temperature of the soil, it is safest to plant southern exposures, and dry, warm soils, during the coldest part of the planting season, and those exposures and soils less favourable during a higher temperature. The number of larch plants that perish annually, consequent upon low temperature of the soil, is very great, and ought to be avoided, if possible.

Although the larch grows at an altitude at least equal to that at which any other forest tree succeeds, yet it is mechanically less suited than some others to stand severe exposure. The larch forms its young wood later in the season than any other forest tree, often growing till the end of October, the top shoot extending upwards in some cases at the rate of nearly half an inch daily. It is subjected at that season of the year to high gales of wind, which prove injurious to the tender shoots, espepecially the top ones. It is often in consequence of the tender top shoot sustaining damage by high winds that plurality of tops are produced; and hence also the short trunk, and broad bushy top of trees highly situated and much exposed. Severe exposure produces another bad effect upon larch,—especially such as are upon the side of a hill, exposed to the prevailing wind,—by inclining them to one side. All larches thus exposed grow up with the greatest number of branches situated upon the sheltered side of the tree. If the tree is freely exposed to the south, the greatest number of branches will be upon the north side; the consequence of which is that the tree becomes bent or like a bow, the *arc* being to the north, and the *cord* to the south. The pith of the tree, too, is nearest the south side, upon which side the zones or annual layers of wood are thinner than upon the north side. The cause of the difference of thickness of zones on opposite sides of the tree is caused by the additional increase of woody matter formed in the vicinity of the branches. Whatever

side of a tree is most abundantly clothed with branches, upon that side the bark is furthest removed from the pith. In order, therefore, to grow larch tall, straight, equally and duly branched all round, with the pith in the centre, and the tree proportionally developed throughout, requires a situation where it is protected from prevailing and high winds, but especially the south and west. As the prevailing winds in Scotland are from the west, larch is therefore best grown in an eastern exposure. Though there are many famous larches and larch plantations in this country upon southern exposures, yet, to say the least, there are equally good ones upon northern exposures. As samples of trees growing upon northern exposures, may be mentioned those splendid old trees at Dunkeld, Dawick House, Kippenross, Novar, Monymusk, Arniston, &c. All the preceding, though northern exposed, have attained at least 90 feet in height, and contain an average of 200 cubic feet of timber. As a rule, the northern side of a hill is best adapted to grow larch to age, and large dimensions, while upon the south side it grows more readily when newly planted, and comes sooner to maturity.

Of all the subjects connected with the cultivation and growth, &c. of larch, none have been so keenly discussed as the kind and quality of soil most suitable for it. Every person accustomed to work in soils and to examine them, knows how much their properties and qualities change as he digs his way down; and though the appearance of soils upon the surface may be much alike, yet at a depth of less than twelve inches they may differ essentially. The different layers or strata of soil may be compared to the geological formation of stratified rocks. In forming an opinion as to the cause of failure of a crop of larch, the trees are inspected, the upper surface of the ground *only* examined, and the conclusion arrived at is as often erroneous as correct.

Moss is not generally regarded as soil suitable for larch, yet the writer has seen as good larch cut upon pure moss as upon any other soil, the roots of which never penetrated either gravel, sand, or clay. This, however, requires a few words of explanation. The moss referred to was thoroughly decomposed, with no fibres, as seen in common peat moss. The moss had also either been rendered dry by deep open ditches, or rendered loose and open by being turned over in the work of draining. Dryness and looseness are essential conditions in soil termed moss, in rendering it suitable for the growth of larch. The best trees are always found upon the margins of the ditches.

The writer is acquainted with a moss of great depth in the county of Cheshire, near Macclesfield, under a crop of excellent larch, and another deep moss in Banffshire bearing a good crop of healthy larch. In both cases the moss was well drained, with deep open ditches, and the trees planted in the earth excavated

from them. A very successful method of planting deep moss is to wheel upon it a quantity of sand, clay, marle, gravel, or any other earth, laying it down in heaps six feet apart, or if difficult to procure, at a greater distance, say nine feet apart, one wheelbarrow load, or even less, in each heap. The heaps are laid up with a spade in shape of a cone, and a larch planted upon the top of each. By this means the roots are kept upon, or near the surface of the ground, which, upon damp, flat, or table-land, is a decided advantage to the trees. Larch planted upon the mound, or hillock system, not only grows faster, but is less liable to ground-rot than those planted in the usual way. In a larch plantation with which the writer is acquainted, one portion was planted upon mounds, and the other upon the flat surface of a deep moss. At about forty years old the difference in value of the two classes of trees was as pounds to shillings in favour of the mound planting.

In planting moss it is essential that it be thoroughly drained to a depth of about four feet. In order sometimes to secure this depth of dry soil above the water table, for want of fall to deepen the drains, ditches have to be cut, and the soil thus excavated employed in raising the ground between them till sufficiently high above the water. Second, Moss suitable for growing larch must be pure decomposed vegetable matter, such as presents no resistance to the progress of the roots. Third, The trees planted in such a manner that the roots may run upon the surface; and in order to promote the latter object, the branches should have ample room to spread; otherwise, from a well-known law, the *tap* and other roots are forced to dip perpendicularly, to the ultimate decay of the core of the tree.

The surface of gravelly soils, as well as of moss, does not always indicate what is underneath; but that larches have both succeeded and failed on gravelly soils of various qualities is certain. At first sight, it is not very easy to discover why a certain gravelly soil, whose granules are nearly the same both in size and proportions, should fail to produce a good crop of larch, when another gravel, exactly like it should yield, a valuable crop.

The difference is *mechanical*, not *chemical*, and is simply explained by the circumstance of one gravel being sufficiently loose and open for the roots to enter and run, while the other is compact, solid, and resistive of the roots, all depending upon the solid or loose condition of the soil.

Amongst others, the following examples may be quoted. A plantation of larch in Strathspey was planted upon a hard, gravelly plain, in which pits had been formed by digging gravel for roadmaking. In and around these pits, which consisted of pure shingle and sand, larches were planted; and while those on the plain unbroken ground were struggling for existence, and many

of them dying, those on the loose gravel were growing luxuriantly, making top shoots from eighteen to twenty inches annually. In this case nothing evidently could produce the difference of growth except the loose, open state of the gravel. Three years ago the writer's attention was drawn to *two* plantations in Morayshire, situated upon the banks of the Findhorn. The one, ten years old, was formed partly upon the sloping bank of the river, extending from south to north in the course of the river, and backwards upon the table-land at top. The trees upon the slope were growing vigorously, while those upon the flat ground were making little progress. On examining the soil and subsoil, it was found that the sloping bank consisted of a loose, open sandy gravel, mixed with a little clay, while that on the flat ground was similarly composed, but was firm and solid. The other at the time referred to was fifteen years old. On the side facing the south the trees were doing well; while upon the side facing the north they were making very little progress the bark was black, and the whole trees covered with *Coccus laricis.*

On taking a general look at the plantation, it was difficult to account for the inferiority of growth; but on digging up the soil the cause soon appeared. The surface soil having been washed and crumbled off, left almost nothing for the roots to subsist upon, the subsoil being hard, compact masses of gravel and moor-pan. On the opposite side of the glen the larches were growing well, and will so continue till the roots enter the hard subsoil, which occurrence will be greatly determined by the future mode of thinning adopted. The above cases illustrate the necessity of examining carefully even unsuspected soils previous to planting.

Next to moss and gravel, clay is considered the most unsuitable for the growth of larch. Drainage may render the soil dry, but it does not sufficiently divide the earthy particles, so as to admit the spreading of the tender roots. Another, and probably the most fatal result of clay soils, wet or dry, consists in the premature and sudden decay of the roots. It appears that the roots of larch grown upon clay soils, which grow luxuriantly for several years, varying from ten to twenty-five, according to circumstances, are of too soft and spongy formation to endure long; hence they suddenly decay, and the tree, in consequence, withers and dies. The temperature of damp clay soils is also too low for the healthy development of larch, and injuriously affects it at all stages of growth. It is on this account probably, more than any other, that flat fertile districts are less adapted to grow larch than precipitous mountain tracts. Much of the failure of larch is due to it having been planted on cold clay soils.

The comparative absence of rosin in the roots of the larch is one of the chief causes of ground-rot (pumping), dry-rot, &c.

The writer's maxim for planting clay soils is,—avoid doing so with larch, as it almost invariably fails on clay within twenty years.

Pure sand is not well adapted for larch, the roots ramify widely at first; but while they increase rapidly, both in length and numbers, such roots as rapidly decay, and render planting a failure. If, however, the trees are allowed abundance of room, the branches and surface roots spread, and the trees may prolong their growth and appear healthy; meanwhile, they are decaying in the base of the stem or trunk. Sand, therefore, though the opposite extreme from clay, produces upon larch the same fatal results, but differently brought about.

Soils composed of certain proportions of sand and clay are termed loams, these vary greatly in quality, according to the proportions of which composed, but are all to some extent adapted to the growth of larch. Soils in which sand greatly preponderates have the tendency of producing over rapidity of growth, with its baneful effects. Those in which clay preponderates either produce succulent roots, which are short-lived, or those of an opposite extreme, which do not nourish the plant. The first is the result of too much water, the second the result of stiffness of clay, which the roots refuse to enter in dry weather.

The writer was acquainted with a larch plantation in the county of Sussex, near Tunbridge Wells, grown upon a sandy loam, with a subsoil of white sand at a depth of 18 inches. The plantation was upon elevated ground, 400 to 500 feet altitude. At the time the writer first saw it, it was thirty years old, and was being cut down. On examining the zones or annual layers of wood, they were found to vary from one-fourth to one inch in thickness. In some cases the trees individually were making 5 cubic feet of wood annually. The plantation was not cut down on account of having attained maturity, but for other reasons. Though only thirty years old when cut, it already showed signs of decay, and would, if it had stood till forty years planted, been considerably past maturity. The heart-wood was soft and spongy, and difficult to cut, producing the same effect upon the saw as poplar or willow. Notwithstanding the softness of the wood when newly sawn, it became much hardened when exposed to sun and air, and such wood was highly valued for weather-boarding houses, being very durable.

The above is a singular instance of the successful growth of larch on sandy loam, and but for the trees being clothed with branches to the ground, and the elevated position of the ground, and thorough open subsoil, which absorbed all superabundant water, they would have died at an early age. Upon similar soils throughout the county of Sussex, where the ground was flat, the

larch died at about twelve years planted, having grown very rapidly up to ten or eleven years. Soft sandy loam on low situations, though the ground was undulating, produced similar effects; hence such soils should not be planted with larch for timber. Spruce is much better adapted for these soils, and pays better upon them than larch.

Upon muiry soil of certain qualities larch grows well, while upon other descriptions it degenerates. In an extensive larch plantation in Roxburghshire, in an elevated district, grown upon moor soil, is an illustration of both success and failure. Part of the ground bears a good crop, and part an inferior one, while some parts are quite bare. Of the soil, when it is dug up or trenched, there is little difference in the appearance throughout the plantation. The difference of growth seems due to the varied conditions of the soil as to compactness or firmness; and as an unvarying rule throughout this plantation, wherever the spade enters freely there the larch thrives well. Where the plants have failed, a hard "pan" is found within a few inches of the surface.

Moor soil that has been under cultivation at any time, and subsequently planted with larch, invariably disappoints the expectation of the planter. The plants grow rapidly during a few years, so long as they enjoy the benefits of the cultivated soil, and inexhausted manure; but the main roots of the tree *thus grown* very soon decay, and it is henceforth only supported by a few minor surface roots, which at most only maintain its vitality; meanwhile the heart-wood is contracting rot, and the whole tree gradually decays.

At the present time the writer is cutting a plantation of larch, about twenty years planted, upon soil as above described, and he finds nearly all the trees "pumped." The few exceptional sound trees are where the soil is naturally deep, and the roots well exposed to the surface.

Within the same inclosure, and similarly situated, are portions of larch planted upon the ground in its uncultivated state, and hereupon the trees, though generally not so large as those upon the once cultivated ground, are quite sound in the heart, and but for the hardness of the soil, I have no doubt would attain a good size and considerable age.

Moor soils are in general adapted to coniferæ, but are often compact and overlying a subsoil of "moor pan," in which latter case no roots will enter or go through. What is therefore required on the part of the planter, is to see that moor soils are free, loose, and open; if they are naturally so (except sand) he may safely plant, but if bound and hard, he must either break up and render them open, or forego the attempt at growing larch.

Sandy soil can probably be less improved for planting (if natu-

rally unsuitable) than all others. Trees root well in sand—few deaths occur immediately after planting, but trees grown upon it are always, when aged (except Scots pine), decayed in the heartwood, and seldom attain large dimensions.

Planting upon gravel is either succeeded by considerable success or almost total failure,—just in proportion as it is loose and open, and mixed with other substances, or solid and pure shingle. Pure gravel is incapable of sustaining larch, but is a beneficial ingredient in clay, moss, and other soils, by keeping them open. Tenacious clay soils are fatal to larch, although it grows fast upon them during ten or fifteen years after planting. The flourishing state of *young* plantations upon clays often induce such soils to be planted. Loams are adapted to grow larch to the highest state of perfection; and yet as many larches have probably died (prematurely) upon loams as upon any other description of soil. Dry loams, *rather poor*, are suitable. *Damp, clayey*, and *rich* loams are not. It is not only necessary on the part of the planter to know the different varieties of soil by name, but also to know them practically, so that when turned up by the spade he knows which are suitable and which are not.

The larch has gained for itself in history a name and place next to that of the oak, and on that account alone claims attention. Our plea for adverting to its history here, is in order to form comparisons, and make deductions, to enable us more fully to ascertain how far it has degenerated or improved since its introduction into Britain.

The first mention of the cultivation of larch in England is made by Parkinson, in the "Corollary to his Orchard," 1629. Evelyn, in 1664, mentions "a large tree of good stature at Chelmsford, in Essex." Sir James Nasmyth planted some larches at Dawick House, Peeblesshire, in 1725. It is also stated that Lord Kames planted some larches at Blair Drummond in 1734. In 1738 Mr Menzies of Meggernie, in Glenlyon, Perthshire, brought from London in his portmanteau sixteen small larch plants, five of which he left at Dunkeld, and eleven at Blair-Athole, as a present to the Duke of Athole. Those left at Dunkeld were for a time kept in the greenhouse, but growing so fast, and for other reasons, were planted outside, where two of them still remain.

In 1738 five larches were planted at Monzie Castle, in Perthshire, said to be of the same sample as those planted at Dunkeld and Blair-Athole. It is said that they were stolen from the carrier, who brought a quantity of larch for the Duke of Athole a few years after those were planted at Dunkeld and Blair-Athole.

Between the years 1740 and 1750, James, Duke of Athole, planted at Dunkeld 350 larches, and during the same period he planted at Blair 873 larches. In 1759 the Duke of Athole

planted 700 larches in one plantation at Dunkeld, mixed with other trees, the last his Grace planted. In 1768, John, Duke of Athole planted 3 acres, all of larch, at Craigvinian, near Dunkeld, at an altitude of from 500 to 600 feet.

Duke John finished the planting of 400 Scotch acres before his death, in 1774. The same account says—"the Duke raised plants to the number of 1000 yearly, from cones grown upon the larches planted by Duke James, and the remainder of plants he purchased from nurserymen (at 6d each) and had great difficulty of procuring them even at that price." "The late Duke John planted, between 1774 and 1815, 1,108,998 larch trees upon 8071 Scotch acres."

A few particulars regarding larch planted in England about the time of its introduction may not be uninteresting.

In 1788 the Bishop of Llandaff planted upon 18 imperial acres 48,500 larches, near Ambleside, Westmoreland.

In 1790 Mr G. Wright, of Yorkshire, planted 11,573 larches upon $3\frac{3}{4}$ acres, at Geldingwells, in Yorkshire.

In 1798, John Sneyd, Esq., of Belmont, Staffordshire, planted 12,000.

In 1800, J. Jones, Esq., of Hafod, Cardiganshire, in Wales, planted 400,000 larches, at distances apart, varying from 2 to $3\frac{1}{2}$ feet.

In England and Wales, several landed proprietors planted, within seventeen years, between 1788–1805, inclusive, 1,240,000 larches.

In 1820, the Duke of Devonshire planted nearly 1,000,000 larches.

Considering the short distances apart at which many of the English proprietors planted their larches, compared with what the Dukes of Athole planted theirs at (6 feet apart), no wonder that the success on their part generally has been less. The wider apart the planting was done, all things taken to account, so in proportion was the success and favourable returns. Notwithstanding the failure of larch in certain places where first planted, and every proprietor, including the Duke of Athole, since 1795, suffered less or more by it, planting of larch has uniformly continued, and still continues, to increase throughout the kingdom. As many millions of larch are planted now, as thousands fifty to sixty years ago.

The number of larches planted annually must be very great; and judging from the increasing stock in the hands of nurserymen, the demand must be increasing also. If diseases of larch were as fatal, and the loss as great (great though it is), as some writers ask us to believe, planting would undoubtedly have long since been discontinued, and the market left unsupplied with wood before now. The reverse of all this is the case. Planting

of larch has continued, and uniformly increased since its first introduction; the markets have continued well supplied, and the quantity has gradually increased. The trade in larch is an important one; numberless are the purposes to which it is applied, and endless the demand. The disposer of larch finds a good and ready market, and the buyer can always be supplied at moderate rates. Judging from present appearances, the larch forests throughout Great Britain, taken as a whole, will continue to yield abundance of sound and healthy wood for many years. Instead of larch wood being exhausted, or even scarce, the prospects are those of increase and abundance. From all the information we can gather, it appears that the failure of larch seventy years ago was due to the same causes as we now find in operation,—wet clay soils; low situations; rich black loam; loose light sand; hard moor, or cultivated and manured soils, having been planted which should never have been.

The Duke of Athole, speaking of the larch blight which occurred in 1725, says—"Trees thirty feet in height, and in high situations, escaped this affection, where the wind could shake them. This blight destroyed the flower of the larch, and prevented the formation of the seed, and consequently the propagation of the plant. The first indication of the blight was a substance upon the leaves resembling small balls, of a fine white matter like cotton. These balls or nidi enclosed small insects, a species of aphis, the two sexes of a very different appearance. They appear to live upon the juice exuding from the bark of the tree, and not upon the leaves, and they probably prevented the sap from ascending, at least no fresh shoots were thrown out by the tree that season. Many trees were much injured by this disease, and for a long time afterwards they presented a remarkable appearance—that of being completely covered over with lichens. On cutting the wood, the fogged part was no more injured in quality than the wood of the healthiest trees, though the lichens had adhered to them for fifteen years. The effect of this blight then was only superficial." The writer has uniformly regarded the *Coccus laricis* of itself a harmless thing, but looks upon it as an indication of confinement, low situation, richness of soil, and general sluggish growth. Healthy growing trees are often partially infested with *Coccus laricis*, and yet attain large dimensions, and are quite sound in the wood. The probability is, that the Duke of Athole describes two or more diseases as one, viz., *Coccus laricis*, and the effects of spring frosts or wet soils. The lichens upon the trees were doubtless due to a wet surface, which luxuriant herbage often induces or promotes. On examining the forests, the writer was very much surprised at the immense quantity of lichens upon the trees at high altitudes, and yet the trees quite healthy. The rocks, stones, palings, and stone

dykes were all equally covered, presenting quite a hoary appearance.

Before proceeding with a statement of those plantations formed within the present century, we may take a retrospective glance at those trees and plantations planted previous to that time.

The old trees at Monymusk, Aberdeenshire, planted in 1740, still healthy and growing; the number and spread of their branches show what ample space they have uniformly occupied. The soil in which they grow is a dry sandy loam, with an open clayey subsoil, abounding with stones. They are exposed to the north, and situated at an altitude of 400 feet.

At Arniston, in Mid-Lothian, there are several fine larches, planted about 1726, all in good health. Their situation is moderately sheltered, but most open to the north. Soil, sandy and gravelly loam; subsoil, porous yellow sand and clay. Some of the larches are growing amongst hard-woods, and have enjoyed similar advantages of room for their branches to spread. Height, 70 feet and upwards; contents, from 100 to 200 cubic feet.

One fine larch is growing at Novar, in Ross-shire, 96 feet high, with a clean stem of 36 feet. Top moderately clothed with branches; age supposed 100 years; contents of trunk, 205 cubic feet; exposure towards the north; soil, dry sandy loam; subsoil, pure water-gravel and sand.

Several fine larches are growing in a glen at Cullen House, Banffshire, planted about 1767. They contain from 100 to 160 cubic feet of timber, are in excellent health, and now increasing at the rate of from 2 to 4 cubic feet annually. They are inland from the Moray Firth from one to three miles, and are sheltered from the sea and other exposures by rising grounds. The soil is a light, dry, gravelly loam, resting in some cases upon clay, and in others upon sandy gravel and water-worn stones. The trees are well clothed with branches, having always had ample room.

An excellent tree is growing at Kippenross, Perthshire, 108 feet in height, and contains 515 cubic feet. Its age is 123 years; exposure north and east. This tree is growing upon dry sandy loam, with a loose gravelly subsoil.

The old larches at Dunkeld, the finest specimens of larch the writer has seen, were planted in 1738, the only two out of the five originally planted at that date. They are situated upon the lawn, and are growing upon a dry sandy loam, mixed with stones and gravel. The trees are well sheltered all round, but most open to the north. The branches of the largest measure, from top to top, 85 feet, and are situated upon the trunk to within thirteen feet of the ground. The estimated present contents of the two trees are 870 cubic feet.

Another very fine specimen of larch at Dunkeld is a tree planted in 1780, about a mile above the abbey, situated within

sixty feet of the river Tay, upon a piece of table land elevated six feet above the water. Its lower branches are 23 feet in length, situated upon the trunk forty feet from the ground, at which height the trunk diminishes comparatively little in girth. Its girth at the surface of the ground is 13 feet, and at four feet up it girths 9 feet 7 inches. It is 110 feet in height, and contains the estimated quantity of 225 cubic feet of timber; soil, light gravelly loam; subsoil, gravel and sand.

Some very fine specimens of larch are growing at Darnaway, in Morayshire, also at Altyre in the same county. Some of the latter contain as much as 208 cubic feet of timber. On both properties the trees are upon light, dry, gravelly loam, mixed with stones; subsoils, gravel and sand.

Many more trees of interest might have been added to the preceding list, but for want of space. It will be found by those who may examine the preceding list of trees, that they are all grown under the conditions set forth as favourable in the preceding pages, viz.:—1st, Dry loose soil, and open subsoil; 2d, Open, but not severe exposure; 3d, Elevated above the frost line; 4th, Ample room, with branches all preserved vital till at least twenty-five years old; 5th, If planted on moss or flat ground, planted either upon the margins of ditches or upon hillocks of earth, so that the roots have been kept near the surface.

Having briefly examined and described, as far as space will allow, the state and condition of the first planted, and now the oldest larches in Britain, the writer will next endeavour to give some particulars of those plantations planted more recently, premising by assuming any one extensive plantation to represent (nearly) all the plantations in Britain.

In giving, therefore, a statement of a large plantation, it may be assumed that an account is given of all upon an estate, or even the country at large. In order to continue the historical chain of the larch unbroken, the following subjects are selected, beginning with No. 1, a plantation comprising about 900 acres, including groups of Scots pine, and also some parts mixed (Scots pine and larch.) It was situated in the county of Inverness, and planted about 1785. It was sold standing, and cut in 1865, being eighty years old. The planting and early history of this plantation are little known, save that the trees had been planted about five feet apart, and the plantation enclosed with a turf dyke. Judging from the nature of the soil, and other circumstances, and a knowledge of the cost of other similar work, the dyke would cost in erecting about 3d. per lineal yard, 2s. 6d. per acre, or L.112, 10s. for the whole fence. The cost of plants, labour of planting, &c., would be about 30s. per acre, or for the whole enclosure, including fencing, about L.1462, 10s.

The object of planting being partly for shelter and partly for

ornamentation, little early attention was paid to it, and no regular systematic thinning adopted at any period, but only trees taken out as required for estate purposes. The thinnings throughout might amount to about L.10 per acre; and the crop in several places, when cut down and sold, realised about L.100 per acre. About 200 trees per acre occupied the ground when sold, which varied in size from 8 to 80 cubic feet. The timber was quite sound, save in a few exceptional cases some ground-rot appeared; but this was confined to a few dry sandy hillocks—subsoil also sand. In pure sand, as previously described, the roots had enlarged greatly; but after ten or fifteen years they had contracted rot, and speedily decayed. The trees varied much in size, consequent on the irregular manner of being thinned when young. Those trees with fewest branches were the smallest in size, while those most abundantly clothed were the largest, and so on; just in proportion to the number of branches, so the quantity of timber. In proof of the very valuable state of the trees in this plantation, a wood merchant, previous to the sale, gave an offer of L.300 for 100 selected trees. No better proof could well be adduced of the valuable state of the trees than this, considering the distance from market, and the difficulty of conveyance to railway, distant about ten miles. The altitude is between 800 and 1000 feet; exposure towards the north; soil, light gravelly loam; subsoil gravel, with large granite stones, and boulders often upon the surface. The mountains surrounding this plantation are nearly the highest in Scotland; the snow is rarely out of view from the site of it in summer, no less than in winter. The locality of this plantation is to Scotland what Switzerland is to Europe, being in each the part farthest inland from the sea. In climate, soil, and other respects, the two countries differ greatly, but are one in the production of larch. The distance from the sea is probably of some consideration in favour of the larch, yet vital importance here cannot be attached to the circumstance. The surrounding land in the neighbourhood of this plantation is letting for grazing purposes at 2s. 6d. per acre, while under larch (at same time during the last forty years it was used as a grazing for sheep) it has produced a return equal to 25s. annually; but from the latter sum must be deducted compound interest on the original 32s. 6d. per acre. After this deduction is made, there is still a large balance in favour of larch planting.

No. 2 is a plantation of larch in Ross-shire, containing 60 acres, planted in 1812, being now fifty-five years old. This plantation was originally enclosed with a turf dyke, and planted with larch at 5 feet apart all over the ground. Little drainage was required, as the ground is naturally dry and open. The whole operations of planting, draining, and enclosing, together with the price of plants, cost about L.1, 15s. per acre. Thinning was w ell attended

to at an early age, owing to young wood being required in the district, and especially on the estate, for fencing purposes. So well was this plantation thinned, that it is found on cross-cutting the trees that they show from their growths to have been rather over than under thinned.

The plantation is situated three-quarters of a mile inland, and at an altitude of 150 feet. It is somewhat sheltered from the extreme influence of the sea by rising ground intervening. The exposure is towards the north-east, and the ground sloping in the same direction.

The soil is a dry sandy loam, with an open gravelly subsoil upon sandstone rock. The herbage is a mixture of coarse grasses and heath. The number of trees upon the ground is 136 per acre, which averages 30 cubic feet of saleable timber. The annual increase of wood at this date is a little over one foot per tree, or say 1s., which multiplied by 136, the number of trees per acre, gives L.6, 16s. per acre per annum. The whole of the crop throughout this plantation is in a thriving and promising condition, and calculated to remain in a healthy growing state till at least eighty years old; at which age, assuming the growth to continue at the present rate, the value would stand thus—136 trees, at present value 30s. each=L.204 per acre. Add to the above the increase of the next twenty-five years, at L.6, 16s. per year, L.170+L.204 =L.374 amount at eighty years. Though quite within the bounds of possibility to attain the latter amount, yet the probability is that it will not attain it, as there are innumerable obstacles that come in the way. Few plantations altogether escape the disasters of wind, and scarcely any altogether escape disease. It is, however, worthy of remark, that this is amongst the most valuable plantations of similar extent of any in Scotland at the present time. Its superiority of growth is due exclusively to the soil and the timeous and judicious early thinning which it received.

The ground surrounding this plantation, and similar to it, is letting for grazing purposes at 2s. 6d. to 3s. per acre. The plantation has been depastured with cattle from an early age; but the ground being hard and dry, the trees have suffered no evil from it; on the contrary, certain benefits are derived from cattle grazing in a larch plantation such as this. The effects of the treading of cattle about the base of the trees are to bare the roots, exposing them to the atmosphere, and thereby encouraging their growth, and rendering them hard and less liable to contract ground-rot; also strong roots so exposed are in great demand for boat-building purposes, and for these high prices are paid. There is little doubt that the grazing in this case has been highly beneficial. Let not this, however, induce any one to pasture plantations with cattle where the soil is wet and of a clayey description; the effects in such cases are decidedly bad.

No. 3 is a series of larch plantations in "the laigh o' Moray," comprising about 300 acres, planted between 1816 and 1826. The cost of enclosing with turf dykes, plants, planting, &c., was between 40s. and 50s. per acre, as near as can be ascertained.

The plants used were generally small,—two year seedlings,—and planted at distances varying from 3 feet to 5 feet apart in the common way of slit planting.

Early thinning was little attended to, except in conspicuous places, till the trees were too far advanced to benefit by it. At twenty years, when thinning was performed, the trees had become tall and slender, with few branches, and could never again, by subsequent treatment, be restored to the state of vigorous growth and value they would have attained if in due time properly thinned.

This plantation is inland from the Mory Firth about 10 miles, and is situated upon the banks of the River Findhorn. The surface of the ground is very irregular, being what is termed hill and vale. Both the active and subsoil vary greatly in quality. The active soil is a sandy loam or gravelly loam, parts also clay and parts gravel.

A very common but mal-practice of thinning had been followed upon this plantation, viz., continuing to cut out trees subsequent to the plantation arriving at an age when thinning could be of no further benefit to the standing crop. Thinning, after the larches were reduced to from 12 feet to 13 feet apart, while it reduced the number of trees per acre, failed in producing any equivalent advantage by way of promoting extra growth in those trees left to constitute the future crop.

The existing crop consists of trees of various sizes, containing from 5 to 50 cubic feet each. The average content is about 10 cubic feet, and the worth about 10s. per tree. The number of trees per acre varies from 150 to 200, and the value in most cases is in inverse proportion to the number of trees per acre. One part, for example, contains 200 trees per acre, at an average value of 8s. = L.80. Another part contains 160 trees per acre, at 10s. per tree = L.80. Another portion contains 150 trees per acre, worth 11s. per tree = L.82, 10s. Small patches, with only 120 trees per acre, are worth 14s. each = L.91 per acre.

In this plantation the soil varies considerably throughout, and no better or truer index need be sought for to point out the quality than the larch growing upon it. Upon the dry, loose, stony, and poor soil, the trees are most healthy and of largest size. Upon stiff, wet clays they have all died. Upon hard ferruginous gravel their growth is slow, and in many cases at an end. Upon moor-pan the remains of small trees are to be seen, pointing to premature deaths. "Deceptive soils" also occur,

good on the top, but bad underneath ; upon such the trees occasionally grow till about twelve years old, and all of a sudden die. But here, though the trees in some cases show signs of impaired health, they yet remain in a paying condition, and continue growing for a number of years longer, especially if duly thinned and the surface dried.

There is probably as much good larch timber, and as large an area of plantation of all ages, sound and healthy, to be found upon the banks of the Findhorn, or, more properly speaking, "the laigh o' Moray," as in any other district of similar extent in Scotland. The larch on Darnaway estate, justly celebrated, has for many years been a source of great traffic. Both the extent and quality of the Darnaway larch have long commended it to just admiration.

The ground originally was planted at 3 feet to 4 feet apart; but for want of early thinning much of the future value of the crop was lost, and being mixed in some cases with Scots pine and Norway spruce, also tended materially to detract from the value of the crop.

The practice of mixing larch and pine will by degrees cease, as the conditions under which each grow best become more fully known and understood.

Notwithstanding various unfavourable circumstances, the larch on Darnaway estate yielded very profitable returns; but as most of the wood was disposed of as thinnings, no definite statement can be given of the value per acre, or of any particular plantation. The greater part of the larch was planted between 1800 and 1820, and soon began to yield profitable returns, and would have paid as a clearing at forty years' old, and might have been so cleared to great advantage, but for a partial mixture of other species of trees.

The soil on Darnaway estate, and especially where the larch best succeeded, is a dry, sandy, and gravelly mixture of earth, and the subsoil in general is either sand or gravel; but the trees are of soundest quality upon granite rock or stones. The tallest and best of the trees are in hollows, where sheltered by higher ground; and as the surface in many parts is very undulating, the difference in value of the crop varies accordingly.

The Darnaway woods are most exposed to the north, but the surface of the ground, being so very irregular, neutralises all effects of exposure from any particular point. The woods referred to are inland from the Moray Firth from 4 miles to 6 miles, but are generally protected from the influence of the sea by intervening high ridges of ground.

In any isolated cases where the larch has failed of making profitable returns upon the above-named estate, it is either from having been planted upon ground too hard, with a stratum of

moor-pan, or in consequence of neglect of thinning at first till too late for the trees to regain due proportions.

If asked by what means the most profitable crop of larch might be grown upon an estate like Darnaway, with soil, situation, exposure, &c., similar, the answer would be—Plant small plants, say two-year seedlings, one year transplanted, at 6 feet apart, or, if exposed to much vermin (as rabbits), plant at 3 feet apart; and when the trees are from 2 feet to 3 feet high thin out one-half, and continue thinning so as the lower branches may be preserved vital, till the crop is reduced to 300 trees per acre. The crop to be cut and cleared when the usual signs of maturity make their appearance.

All clays to be planted with oak and ash, rich spots of dry dark loam with elm, flat sand and moss with Norway spruce, bare barren peaks with Scots pine, and the remainder with larch.

Another excellent estate for larch in the same neighbourhood is Altyre. There the soil, situation, &c., being much the same as on Darnaway, no description is required. The larch plantations on Altyre estate are worthy of particular notice, both on account of their extent, condition of growth, and general importance. The woods comprise about 6000 acres, a large extent of which is composed of larch. The surface of the ground is diversified and irregular; part of it is flat, and parts at every degree of inclination. On some parts, especially the sloping banks, there is larch of surpassing perfection, and trees approaching magnificence. On the flat ground, extending backwards from the tops of the banks, larch in some places refuses to grow at all. The soil, both on the slope and plain, is alike. Whence, then, the difference in point of growth? It may be explained thus:—On the sloping ground, from the *position* of the particles constituting the soil being different from *that* of the flat ground, *they being more loose and open*, admit the roots more freely than where they are firmly compressed on all sides, as is the case on the flat ground.

On examining the roots of trees differently grown as above, it is found that in the case of compact gravelly soil the roots are crooked, twisted, and often so compressed as to stop circulation of the sap. On the other hand, on loose open soil the roots are comparatively straight, more fleshy, and less compressed. The effects of hard compact gravel are twofold. First, an obstruction to the roots, and a means of corrupting the fluids to the entire stoppage of the sap; and second, by the extreme difficulty of the roots elongating their spongioles in search of food, the trees are consequently improperly nourished.

Along the base of the precipitous banks, where the ground is as flat as on the top, larches are growing in a very superior way, better even than those upon the incline. The latter circumstance is explained by the soil upon which they grow having crumbled

off the ground above, and in course of time accumulated at the base, forming just the sort of loose open soil which larch thrives best upon.

On certain parts upon the sloping banks, the trees are either of stunted growth, or have failed entirely. Upon such parts it is found that the active soil has entirely crumbled, and been washed off, leaving only a stratum of hard gravel quite impervious to the roots. Some young trees so situated are partly covered with the *Coccus laricis*, and are looked upon and spoken of by many as subjects under prejudicial atmospheric influences and "diseased larch."

No. 4 is a plantation in Aberdeenshire, comprising about fifty acres, and is thirty-eight years old. It was enclosed with turf dyke and paling, and planted at distances apart of 3½ to 4 feet. It is inland from the sea about twenty miles, and situated at an altitude of about 400 feet. The original cost of plants, planting, and enclosing, would be about L.2, 5s. per acre.

The combined objects of planting were—shelter to the surrounding fields, in which it has proved a true success;—beautifying the estate, and finally, of yielding a good return for the money invested.

No thinning of any importance was ever done; but nature assisted in her own work, by way of the largest and strongest trees overgrowing and destroying the weaker ones. The result of the plantation being left to nature was, that out of 3500 trees planted, one-third only now remains of living and growing trees; and were the plantation to remain till sixty years old, 500 healthy growing trees would be the maximum number per acre.

Owing to want of early thinning, the crop of trees, when the plantation was cleared of all dead wood (which was abundant), had a clean and pleasing effect. The tall, clean, though slender stems, left the ground clear and open, and good for pasturage.

This plantation is probably now at its highest attainable value, when about 1000 trees per acre occupy the ground, and are worth about 1s. 8d. each, making the value per acre L.83, 0s. 8d. Allowing L.13 per acre for original outlay and interest, L.70, 0s. 8d. remains to be divided over thirty-eight years—the medium age—equal to 37s., nearly the annual return per acre.

The ground surrounding this plantation is letting at about 5s. per acre, thus showing that certain soils planted with larch is a very profitable investment, and ought to be taken advantage of when it occurs. This plantation is also depastured, and for that purpose is worth at least 3s. to 4s. per acre, at same time the progressive value of the crop of wood is over L.2 per acre annually, and calculated to increase.

No. 5 is a series of plantations upon an estate in the south of Inverness-shire, comprising in all about 200 acres, which may be

described as one plantation. The whole was planted between the years 1817 and 1827, the oldest part being now fifty, and the younger part forty years old. The trees were planted 4½ to 5 feet apart. Turf dykes enclosed nearly the whole plantations; but, as already stated, being in detachments, nothing reliable can be given as to the actual cost. As the joint object in forming this plantation was for shelter and profit, so long as it fulfilled the former, and was too young to yield to the latter, no attention was paid to it by way of thinning till nearly thirty years' planted, when parts were thinned for pit props; and in thinning for this purpose, instead of cutting down all the inferior growths and sickly trees, the reverse of this was practised, and in general those trees were cut which were most suitable for the market, without respect to the permanent crop. The result of this was that many of the slender updrawn trees were blown down.

This practice of thinning was not continued throughout the whole extent of the plantation, hence portions of it escaped the improper treatment. At the present time this plantation is in general in a thriving state. Having a dry soil and subsoil favours it greatly. Where the trees are not in a vigorous state of growth, it is owing to the soil being too hard and impervious for the roots to run in; but where the soil is at all loose and open, the trees are growing well. The following are three respective valuations of the crop:—First valuation, 300 trees, at 5s. 8d. each = L.100. Second, 240 trees, at 4s. each = L.49. Third, 220 trees, at 3s. 6d. each = L.38, 10s. In the former estimate those acres containing the largest number of trees are of most value, because the good trees were not cut down; and in the latter case, when the number of trees is small, the value is also small, because that in thinning both the best trees were cut, and the number per acre at same time reduced, so as not to leave the ground properly covered.

The altitude at which No. 5 is situated is between 700 and 800 feet. The exposure is towards the north, but variously sheltered and exposed by the undulating nature of the ground. The planting in this instance is quite successful, but would have been more so had the trees either been planted at 6 feet apart, or the first thinning been performed when under ten or twelve years of age.

The ground similar to that planted is letting for grazing purposes at 2s. 6d. to 4s. per acre, and here the grass in the plantation is of as much value.

No. 6 is a larch plantation in Roxburghshire, intermixed with Scotch firs. It was planted from 1820–1822, both inclusive. The plantation is situated upon the ridge of a hill extending from south to north, at an altitude between 400 and 500 feet. The soil is of various qualities, but the greater proportion is of a clayey nature, resting upon yellow clay, whinstone rocks abounding in

the district. The plantation extends to about 35 acres; its form is oblong, about 1300 yards long, by 120 broad. It is enclosed with a turf dyke, at the time of its erection the most common fence in that part of the country.

As far as can be ascertained, the following is the cost per acre, including all expenses :—

89 yards turf dyke, at 2d. per yard,	L.0	14	10
3000 plants, at 12s. per 1000,	1	16	0
Planting the above, at 4s. per 1000,	0	12	0
360 yards open drain, at 1d. per yard,	1	10	0
Incidental expenses, including carriage of plants,	0	4	0
	L.4	16	10

The young trees were slit-planted with the common spade. Some beating up was required each of *three* seasons after planting, the expense of which is included in the original estimate. After planting, the trees received no further attention till about seventeen years planted, when thinning was performed upon the most advanced parts, at which time about one-half of the number of trees planted had died; a healthy larch was the exception. After the first commencement of thinning, it was regularly and systematically carried on up to the present time, but nothing like a profitable crop at any time occupied the ground. At forty years planted, parts of the crop were valued, and the valuations stood thus :—No. 1, 200 trees, at 1s. 6d. each = L.15. No. 2, 220 trees, at 1s. 8d. each = L.18, 6s. 8d. No. 3, 190 trees, at 2s. = L.19. No. 4, 240 trees, at 2s. 6d. each = L.30. From the above it will appear what progress the trees had made. The wood in each tree is calculated at 1s. per cubic foot, so that the largest average did not exceed 5 feet, which is a small increase compared with the growth of many larch plantations. The deficiency of growth may be accounted for from the stiff clay soil, cold subsoil, and neglect of timeous thinning.

That the clay soil was the chief cause of failure may safely be inferred from the circumstance that two dry gravelly hillocks occurred, one near each extremity of the plantation, and it was on these hillocks that the best trees were found. For grazing purposes these hillocks were not nearly so valuable as the general ground throughout the plantation, yet for the profitable growth of larch they were infinitely better. One portion, a piece of heath-covered ground, produced decidedly the best crop of trees, free from "ground-rot," and equally free from "blister," and in general good health.

A section of this part also showed a great superiority of growth over all the rest, which may be accounted for from the turf having been pared off the ground previous to planting. On this parti-

cular part the best grown trees in the plantation are to be found, and the soil, &c., being the same as that which surrounds it, if the favourable growth is not to be accounted for from the turf having been pared off, it is difficult to conceive how it is to be explained. The same superiority of growth is also observable where the turf was taken off to form the fence; this latter circumstance, though often observed, is generally attributed to the shelter afforded by the fence, which might be so in the latter case, but not in the former, it being in the central part of the plantation, and distant from the fence.

One other observation is, that near the north end of the plantation the trees are much taller and of faster growth than near the south end. The most likely way of accounting for this is in consideration of the shelter from the south being more essential than shelter from the north, which the main body of the plantation here gives.

No. 7 is a tract of larch in Ashdown Forest, between East Greenstead and Rotherfield, in the county of Sussex. One part, comprising about 300 acres, is worthy of special remark.

The larches here, and generally all over this part of the country, are planted from 2 to 2½ feet apart, and allowed to remain at that distance till about twelve to fourteen years old; at the latter age about three-fourths of the crop are cut down for hop-poles, leaving the remaining one-fourth to grow up as a crop of timber. The result of this severe thinning is injurious to the remaining crop, even in England, and would probably be fatal in Scotland.

If a high wind occurs within twelve months from the time of thinning, many of the trees are thereby uprooted, as was the case to some extent with the plantation referred to. One circumstance favours greatly those trees left as the crop, viz., their comparative conical form; this circumstance happens on account of conical-shaped trees being less suitable than cylindrical ones for the purpose of hop-poles, hence such are left, their girth at base being too great in proportion to their height. After a few years the trees recover, and increase in size just in proportion to the number of branches upon them; those trees always growing quickest which are most conical in shape, while those of a cylindrical form are much slower in growth, save in height.

The difference of growth is not due to the shape of the tree, but to the branches situated near the base of the trunk which supply the roots with nourishment.

Several circumstances tend to the success and rapid growth of these plantations. The distance from the sea, twenty miles; altitude, 400 to 500 feet; soil, dry, open hazel loam, resting upon iron ore; free open exposure; and no mixture of evergreen trees. The variable state of the soil manifested itself here in the following ways:—In one place a poor white sand prevailed, upon which

the trees were all "pumped," and their growth nearly over. In a few places clay prevailed, and hereupon the dead stocks showed that the trees had died about fifteen years planted. "Moor-pan" was found in some parts, and where the trees came in contact with it, the growth had ceased early, and those still living showed a general rigidness and stuntedness of growth.

The only apparent difference between larch grown in the south of England and the north of Scotland, consists in the rapidity of their growth in the former country, and of attaining maturity at an earlier age. Eighty years may be the maximum age for a larch plantation in the county of Argyle or Ross-shire, and fifty the maximum age for plantations in Sussex, Surrey, or Kent.

To what extent the climate affects the larch is difficult to know; all the difference may arise from qualities in the soil. To all appearance, larch would not survive to so great an age in the south as in the north, and the quality of the wood generally in Sussex is much softer than it is in Inverness-shire, taking trees of the same dimensions and age.

One district of Ashdown Forest, on which the writer has seen much larch cut, leads to the belief that soil is the producing cause of all difference and distinctions. The larch referred to was grown upon dry gravelly moorland, on the exposed part of a hill 500 feet altitude; here the quality of the wood was hard, and close in the grain, but not so red in colour as is often seen. Where the quality of the larch was of the latter description, it was grown on soil of the poorest class, and where much exposed, and only in small patches. The great consideration in planting larch in Sussex, Kent, &c., is to select dry soils of the poorest description, avoiding pan, sand, and ferruginous gravel. Almost all other dry soils are safe to plant, except when the ground has been under cultivation, or newly cleared from a previous crop of trees. Throughout Ashdown Forest many acres of larch are to be seen, of equal value and importance to that in any other part of this country.

The following are a few valuations of different small plantations in Ashdown Forest:—No. 1. Trees fifty years planted; soil dry gravelly loam, with gravelly subsoil; exposure east, sheltered from south and west; 300 trees per acre, average contents, 20 cubic feet; 6000 feet at 10d. per foot = L.250. No. 2. Age of trees forty years; soil light hazel loam, sand subsoil; 400 trees per acre, average contents 10 cubic feet; 4000 feet at 10d. per foot = L.166, 13s. 4d. No. 3. Age thirty-five years; soil sandy loam; 400 trees per acre, containing 6 cubic feet each, at 10d. per foot = L.100. No. 4. Age forty years; soil light moorland, open dry bottom; 500 trees per acre, average contents, 4 cubic feet; 2000 feet at 10d. per foot = L.83, 6s. 8d. No. 5. Age thirty-two years; soil clayey loam, subsoil white sand; number of trees

per acre, 60; average contents, 30 feet; 1800 feet at 10d. per foot=L.75.

The following is an example given of the value of a crop of larch in the county of Huntingtonshire, the property of His Grace the Duke of Bedford. This plantation was originally a very large one, and the first planted upon the estate, but the part to which the following statements apply composed the last part of the clearing, twelve acres, at fifty years old. The plantation was sold in 1864, and realised the following amount, stated thus:—

1300 trees, containing altogether 10,000 cubic feet, at 1s. 2d. per foot, ...	£583	6	8
And 43 tons larch bark, at 40s. per ton, .	86	0	0
	£669	6	8

Or thus:—L.669, 6s. 8d÷12 acres=L.55, 15s. 6½d. per acre.

The following is a statement of some interest upon the cultivation of larch, upon the Duke of Bedford's estate in Northamptonshire, parish of Thornhaugh:—

The plantation comprises an area of 55 acres, upon rather stiff but dry soil, resting upon limestone rock.

This enclosure, previous to cropping with larch, bore a crop of oak and ash, which was cut down, and the ground trenched.

It was planted with larch at the rate of 4000 trees per acre, and thinned at twenty-three years old, yielding to the amount of	£10	14	0
The expense of thinning was 18s. per acre,—deduct	0	18	0
	£9	16	0
Standing upon the ground after thinning, 1000 at 1s. 6d., ...	75	0	0
Net value of crop, at twenty-four years planted,	£84	16	0
Expense of trenching the above, per acre, . .	£16	0	0
Plants and planting cost	5	8	0
Incidental expenses, ...	1	0	0
Total cost per acre, . . .	£22	8	0

To those interested in the growth of larch, an account of His Grace the Duke of Athole's will be gladly received. Various statements regarding the Duke of Athole's larch forests are already before the public. A very full account of them is published in the "Transactions of the Highland Society" for 1832, from which the writer has taken some extracts. Thirty-five

years have elapsed since the account referred to was given, hence great and important changes have taken place since then. To give anything like a detailed account of the above forests would occupy space far beyond the limits of this paper. Nothing, however, will be withheld that is considered sufficiently important to prove of practical use to those interested in the culture of larch.

As already stated in a foregoing part of this paper, the first larches known authoritatively to have been planted in Scotland are the two now growing at Dunkeld, and six at Blair Athole, planted in 1738. Those at Dunkeld are very fine specimens. Those at Blair are neither so tall, so thick, nor contain so much timber as those at Dunkeld. Of the five planted at Dunkeld in 1738, two were cut in 1809; one of them contained 147 cubic feet of timber, and the other 168 feet, and were sold at 3s. per cubic foot. One of the remaining three was cut some years afterwards by Mr M'Crostie, the gardener and superintendent of planting, by misapprehension, to make an axle for a mill wheel, but was never applied to the purpose for which it was cut.

The two remaining ones of the five are still in a growing condition, and though they have begun to show signs of decay, they might yet survive many years. The largest, in 1831, was estimated to contain 350 cubic feet of timber, and now contains altogether, of measurable wood, about 470 cubic feet, the other about 50 feet less. In 1831 the largest tree at four feet from the ground girthed 12 feet, the other at same date girthed 11 feet. In 1867 the largest tree girthed at four feet from the ground, 16 feet 10 inches, and the smaller one at same height girthed 14 feet 10 inches.

Of the eleven larches planted at Blair, six only now remain, the others having been cut or blown down. They are by no means either so large or so handsome as those at Dunkeld of the same age, but are equally healthy, and, in the writer's opinion, will continue to grow when the latter have ceased. In 1867 their circumferences were as follows, measured at three feet from the ground:—No. 1, 12 feet 9 inches; No. 2, 11 feet 6½ inches; No. 3, 10 feet 10 inches; No. 4, 10 feet 8 inches; No. 5, 10 feet; No. 6, 10 feet 8 inches.

The average estimated contents of the above are 180 cubic feet of measurable timber. One reason, and probably the principal one, why the larches at Blair are both of smaller size, and less handsome than those at Dunkeld, is in consequence of severe exposure; they had evidently all lost their leading top at a comparatively early age, and large branches have at different times been broken off—a common result of severe exposure. They are also much bent and crooked, like those at Dawick House, Peeblesshire.

The trees are situated along the margins of the stream Banvie, and though sheltered for a time by the rising ground on either side, yet as soon as they had reared their heads thirty or forty feet, the cutting winds had blasted, broken, and contorted their tops.

The soil is a dry gravelly loam, resting on gravel and stones; altitude above the sea about 500 feet. These large larches at Blair and Dunkeld are so far distant from each other, and from other trees, as to render their condition similar to that of single trees. None of them have ever been pruned, or in any way cut, save when wind-broken branches occurred. Some of the large branches near the ground are sufficient to make railway sleepers, and spread a great distance all round. The circumstances which have favoured the growth of the above are briefly these:—Dry soil and subsoil; open, but not severely exposed situations; abundance of room; free from the influence of the sea and spring frosts; young plants well branched and rooted; ebb planting, or means whereby the roots are kept upon the surface.

In addition to the trees above described, there are many more worthy of description, both in the grounds about Blair and Dunkeld, whose ages vary from 117 to 127 years, and contain at least 200 cubic feet. One tree, on the south banks of the river Tay, is worthy of special notice; it is by far the finest grown larch the writer has yet seen. It stands from the margin of the river sixty feet, and at an altitude of six feet above it. The soil is a dry sandy loam, mixed with gravelly stones. The tree is 120 years old, 115 feet in height, girth at four feet from the ground 14 feet, and contains 230 cubic feet of timber.

A class of trees still younger than the above, having been planted in the year 1759, in detachments, about Dunkeld,—the greater part of the trees of this age have been cut down on account of showing signs of decay. They were planted as a *plantation*, hence less room afforded them than those as single trees for ornamentation.

Those trees remaining of what was planted in 1759, are mostly in a backgoing condition, caused in some measure by want of room; though sufficiently well grown as a crop for profit, they are not so well calculated to stand till old age.

His Grace John Duke of Athole planted in various ways 410 acres, between the years 1859 and 1774, the greater part of which was cut down several years ago, at various stages of perfection, but in general they proved remunerative. A large enclosure was planted near Blair Athole, between the years 1777 and 1782, being now between eighty-five and ninety years planted. Thinning was attended to when about twenty years planted, but in this case it was evidently too long delayed. The trees in this plantation were planted between five feet and six

feet apart, and, as a natural result, some of the trees died when young, which gave the surviving ones double advantage, which, as may be seen at the present time, they fully availed themselves of, and enjoyed. Some of the trees so favoured now contain 75 cubic feet and upwards, and are from 80 to 90 feet in height, while the average trees, though quite as tall, contain only about 25 cubic feet of timber. This plantation is now partly cut down, hence cannot be properly valued; but, seven years ago, it contained an average of about 200 trees per acre, at 25 cubic feet each = 5000, which at 1s. per foot amounts to L.250, being the maximum value it was capable of attaining. The plantation, as it now stands, is worth about half the latter sum per acre.

The trees in this plantation are of largest size, and altogether best upon the north side, which is sheltered from the south by the rising ground, at an altitude of about 600 feet. The ground is upon an incline of about one in four, and the surface smooth and regular. The soil is a hazelly loam, with a dry gravelly subsoil, except where "rotten rock" prevails, which is wet.

One portion of this plantation, at the medium altitude, presents some ground rot; and the writer being anxious to know the cause, on examination, found, at a depth of about one foot, a compact solid substance known as "rotten rock." This soil being impervious to the roots, and surcharged with water, had caused the central roots to decay, whence proceeded the rot in question.

The gross return per acre per annum from this plantation throughout the period of its growth is over L.3. Deductions, however, must be made for general maintenance, and compound interest upon the original outlay: with due allowance for the latter sums, the planting of larch in this case has proved a profitable investment. The surrounding ground in its uncultivated state is worth about 10s. per acre for grazing purposes, while the grass in the plantation is, and has been during the last twenty years, worth about two-thirds of the value of that unoccupied with trees.

Loch Ordie and Loch Hoshnie plantations may be regarded as one, or at least described here as such, being all within one boundary, and in most other respects much the same. The combined contents of the two plantations amounts to 5190 Scotch, or 6545½ imperial acres—the largest larch plantation probably in Britain. The planting was completed in eleven years, being commenced in 1815 and finished in 1826, and is perhaps the greatest undertaking of planting ever executed by one person. The total number of larches planted upon the estate between 1738 and 1826 amounted to 14,096,719 plants, which at the rate of 2000 plants per acre (some of the ground only 1200 per acre), covered an area of 10,324 imperial acres.

The instructions were to plant larch (alone) at distances apart of 6 feet; but they seem not to have been duly attended to, as

at the present day the trees are still growing within 4 feet of each other (from centre to centre). This, however, is more the case at Loch Hoshnie than at Loch Ordie, which may be accounted for in various ways. Loch Hoshnie being an out-of-the-way place, and far distant from the home of the inspector (Mr M'Crostie), inspection might be less assiduous. The ground being muiry, poor, and thin and cold, failure to some extent at least might be anticipated. Be this as it may, the orders from his Grace were to plant six feet apart. The soil throughout this vast forest varies greatly—in some cases it is wet and boggy, in others bare and rocky; some parts are stiff clay, and others deep rich loam.

The rock formations most prevalent are gneiss, clay-slate, and mica-slate: the last and first mentioned sorts are most abundant. The altitudes of this forest vary from about 500 to 1200 feet; and it is remarkable how little the altitude effects the growth of the trees. Where the soil is deep and dry near the tops of the hills, the trees are equally as healthy as at their base, and in point of girth are nearly the same, but not so tall. The only material difference arises from the casualties which befall the top shoots severely acted upon by high winds, causing the growth in autumn to stop before it would otherwise do so. It is on the latter account that trees increase more in girth than height as the altitude ascends; but, as already stated, this is consequent on damage done to the leading shoots while they are soft and tender, and it is by preventing the latter occurrence that shelter, especially from the prevailing winds, is so highly beneficial.

The earliest planted portion—that at Loch Ordie—now fifty-two years old, is a very fine crop of larch, but must be seen to be duly admired. A hundred acres or more may be met with in one place where the trees bear a marked resemblance to each other—the straightness of the trunk, with a gradual but imperceptible diminution of girth from the base to near the top, cleanness of stem, as if polished by the hand of art, to a height of thirty feet to forty feet and upwards, where a light canopy of drooping spray crowns the elegant column. The trees, according to altitude, vary in height from fifty feet to seventy feet and upwards. The bark is peculiar. When the ground is dry, it is of a reddish-grey colour; when somewhat damp and sheltered, the bark is light, almost to whiteness; and when situated at a high altitude, and where the soil is damp or wet, the trees are covered with moss and lichens, presenting quite a hoary and shaggy appearance.

The rule of six feet distant planting had been more strictly observed on some of the hill-sides around Loch Ordie than in most parts of the forest. In some instances the trees are yet standing at the same distances as when planted, showing that they had not at any time been thinned. On such parts the

value of the trees is three-fourths less than where they had been thinned when about twenty years old. Not only is the *present* difference in value in favour of timeous thinning, but the older the trees grow the difference becomes still greater. At fifty-two years old the thinned part is worth 8s. per tree on an average, while the unthinned part is worth only 2s. per tree. Allowing the plantation to stand till eighty years old, the difference in value, as indicated by the present proportional growth, will then be—the thinned trees 35s. each, and those unthinned 5s. each. In other words, the unthinned trees at fifty-two years old are worth one-fourth that of the thinned ones, while their prospective value at eighty years old will be only one-seventh.

Though the individual trees differ in value seven-fold, the value per acre does not so differ. The unthinned parts, 6 feet distant, contains 1200 trees per acre, at 5s. per tree = L.300; and the parts thinned out to double that distance, contains only 302 trees per acre, at 30s. each = L.472, thus making the true value of an acre thinned out to half the number planted at 6 feet, between one-fourth and one-fifth more value than the part left standing at the distance planted. At the end of eighty years there is a balance in favour of thinning to the amount of L.172 per acre.

The above calculations show the proportional rather than the true increase and value of the wood. In consequence of the want of thinning till the lower branches had withered and died, the trees thus lost the means by which their growth is promoted, and which under the best future management could never again be restored, or attain the above estimate.

On examining the concentric rings or layers of wood of a number of trees in various parts of the forest where they were cut and laid in heaps upon the road sides, it was quite observable where the proper period of thinning had been exceeded. Most of the trees planted at from five feet to six feet apart had made annual layers of wood from one-sixth to one-fourth of an inch thick, till about twenty years old, about which time the branches met each other, and thus excluding light and air, speedily destroyed their vitality. After this occurred, the growths annually decreased, and by the thirtieth growth, in many cases, instead of making annual layers of one-sixth to one-fourth of an inch in one year, one-fourth of an inch was only made in four or five years. With these facts before us, the urgency of thinning at the proper time, in order to keep vital the lower branches, must appear natural and reasonable to any one acquainted with the laws of vegetation. The important function of the lower branches to trees of any age (but especially young ones) are too little regarded. By the lower branches the roots are nourished and fed, by the latter the sap is absorbed and conveyed to all

parts of the tree; and just so in proportion to the healthy and proper condition of the roots is the whole structure of the tree supplied with wood-forming materials.

The crop of this immense forest may average 200 trees per acre, and the average market value may be 6s. per tree, thus making the value L.60 per acre. Doubtless, many acres are worth more than the above, but others are worth less; so that L.60 per acre may be considersd a fair average of the whole. The fencing, planting, &c., of these forests are stated to have cost something less than 30s. per acre, detailed thus :—

2000, 1-year transplanted larch, at 7s. 6d. per 1000,	L.0	15	0
One man 2 days, at 2s. 3d. per day,	0	4	6
One boy carrying plants, at 6d. per day,	0	1	0
Enclosing at the rate of 5s. per acre,	0	5	0
Clearing Juniper, Draining, &c.,	0	4	0
	L.1	9	6

The success of the above forests will bear a favourable comparison with any in Scotland; and yet it is very evident that much is to be learned from points of failure as well as success; and with the additional experience of half a century, it is only strange that so very little advancement has been made in the growth and culture of larch. The undulating nature of the ground favours the growth of larch in the Athole forests. It is well understood how readily water runs off a hill face, and how soon not only its herbage, but its soil, becomes dry after rain or melted snow, compared with level ground. Much of the *soil* in the Athole forests is too clayey and wet for the proper growth of larch, and but for the sloping nature of the ground, would fail to grow it at all, or at least to valuable dimensions. The soil, therefore, though too stiff and wet to grow larch on flat ground, will nevertheless grow it comparatively well upon an inclining surface.

Again, the Athole forests are far inland, and beyond the influence of the sea, an advantage which many districts otherwise suitable do not possess.

On elevated grounds, the effects of frost are little felt compared with low and damp situations, and in this respect the Athole larch (with few exceptions) enjoys an advantage.

The great extent of forest, too, contributes its beneficial influence by modifying and softening hard blighting winds, which greatly damage the foliage in early summer; the irregular surface of the ground (hill and vale) also acts in a similar way.

An immense advantage given to the Athole larch forests was the distance apart at which the trees were planted. Six feet was the distance specified, and where that was adhered to, the great

advantage to the crop is still apparent as compared with closer planting. It is true, close planting and early thinning will accomplish the same end; but it rarely happens that thinning is done in time to prevent the death of the lower tier of branches. As well may we expect an animal to be healthy and thriving with only one lung, as look for a tree to be so with only a few branches at top. The plants were in general small, and were planted without burying the roots too deep, a very prevalent error even in modern planting, and one which should be carefully avoided on the part of the larch.

The writer has made several experiments in order to prove the difference between deep and ebb planting, and has found as the result, that on rich and deep soil the deep planting proved more frequently fatal than on light dry soil; but in all cases, and on all soils, if the roots are covered, it is all that is required for the prosperity of the trees.

No importance seems worthy of being attached to the rock formation; the trees grow equally well upon all the different rocks, provided only there be open fissures and crevices for the roots, and the ground dry—all of which advantages the Athole larch possesses in a large degree, with exceptional cases, however, sufficiently clear to prove the rule.

The practice of keeping down rank and luxuriant plants, including juniper, whins, brackens, and grasses, for several years subsequent to planting, tended greatly to promote the prosperity of the young plantations, and is a practice worthy of our imitation.

Another circumstance, regarded by some persons as the most potent of all, in rendering the Athole larch so pre-eminently successful, was the seed, most of it having been imported direct from its native mountains in Italy or Switzerland. Whether this be of vital importance or not has not yet been fully established; but one thing is certain, that the first plants introduced have not been surpassed in growth by those raised from seeds from trees acclimatised in this country, or from Tyrol. Again, from the fact of the oldest larches at Dunkeld and Blair having been grown in the London nurseries, and even grown and treated as exotics, was in no way prejudicial to their future success.

The greater part of the Athole larch forest is depastured with blackfaced wethers, which are purchased in autumn when two years old, kept over winter and during the succeeding summer, and sold next autumn, having been kept twelve months. This mode of consuming the plantation grass is profitable, and adds very considerably to the revenue from the woods and forests. In conversation with the shepherds, they informed me that though their cows do very well in the forests, yet they produce more butter, by at least one pound per week, when grazing on open pasture. The butter, however, is fully admitted to be sweeter

and of richer quality, produced while grazing under the larch. It is here worthy of notice, that a considerable portion of the forest is in a state too wet to be judiciously grazed with cattle, their footprints are such as to form basins for the water to stand in, to the injury of the roots of the trees. Dry ground does not so suffer.

The forest operations are conducted under one general manager, with a staff of subordinates to carry out details.

The wood is generally disposed of to wood-merchants in the growing state, who cut and manufacture it themselves. The prices (abating bark) are from 1s. to 1s. 4d. per cubic foot, 1s. 2d. being the general selling price. Much of the wood, in form of thinnings, being too small to admit of being sold by measurement, instead of being sold by the foot, is sold by the tree or number of trees.

Having briefly described the soil, condition of the crop, its value, &c., we shall next proceed to indicate certain conceived defects, feeling justified only in doing so by the loud and earnest demands of rural progress and enlightenment of the age:—

First, Much of the soil is too stiff and cold, and surcharged with water, hence the results of slow growth, &c. *Second*, The commencement of thinning had been too protracted, and evidently, in some cases, continued till overdone. *Third*, Considerable portions of ground are under larch which should have been under oak, silver fir, Norway spruce, and Scots pine, thus giving rise to the unjust complaint, "Failure of the larch."

His Grace John Duke of Athole, who was perfectly aware that larch would not grow on every description of soil, says, "It is an error to suppose that the larch will thrive on all soils and in all situations. There are many kinds of soil in which it will not thrive, and ought not to be planted. It has been found that larch cankers in wet situations, and contracts heart-rot in wet subsoils. In cold and damp situations it becomes fogged and covered with lichens." The duke's observation and experience in these matters entirely agree with our own, and are forcibly confirmed by what is to be seen throughout the forests in which he took such high delight and deep interest, and in which he won unprecedented fame, thereby endearing himself to all true lovers of sylvan grandeur and magnificence.

Under all circumstances, the Athole larch forests have succeeded to admiration; and, considering that the planting was in a manner experimental, the result may justly be regarded a success.

The Athole forests are very extensive, the largest in Britain (of a private kind). The entire area under larch is stated to be about 10,324 imperial acres, and the trees originally planted upon it 14,096,719. The earliest operations of planting were

conducted under very unpropitious circumstances, amongst which may be mentioned the difficulty of obtaining plants, and the consequent high prices. All the larch plants the duke was able to obtain, between 1774 and 1783, amounted only to 279,000, and cost (two years transplanted larch) 6d. per plant. After about 1780 the price of plants (two years transplanted) fell from 6d. per plant to 35s. per 1000. From that time downwards the prices have varied from 18s. to 12s. per 1000, according as the crop was plentiful or scarce; but the average price during the last fifty years is considered 12s. 6d. per 1000.

One of the causes of disappointment as to the pecuniary returns of the larch arises out of the circumstance of too much having been expected of it. In a report of the Athole larch, to which reference has been already made, the duke expected to realise £1000 per acre. "Suppose," says the report referred to, "the plantations are thinned out by thirty years old to what they are to stand for ship-timber — that is, to 400 trees per Scots acre—suppose after that period the whole were cut down at the following respective ages, the value of the whole per acre at the different periods would be as follows:—

400 trees, 30 years old, at 2½ cubic feet each tree = 1000 cubic feet, or 20 loads, at 1s. 6d. per foot, .	L.75	0	0
400 trees, 43½ years old, at 15 feet each tree = 6000 cubic feet, or 120 loads, at 1s. 6d. per foot, ...	450	0	0
400 trees, 59 years old, at 40 cubic feet each tree = 16,000 cubic feet, or 320 loads, at 2s. 6d. per foot profit, ...	2000	0	0
400 trees, 72 years old, at 60 cubic feet each = 24,000 cubic feet, or 480 loads, at 2s. 6d. per cubic foot profit, . . .	3000	0	0

The average of these prices would be L.1381, 5s. per acre, so that L.1000 per acre is not too high a calculation of the value of the duke's larch plantations."

A modern writer of considerable eminence, and whose authority in general arboriculture is of no small weight, gives as the result of his experience of a plantation in Mid-Lothian, at sixty years old, a *clear profit* of L.509, 17s. 4d. per acre. Another author, still more modern, gives as his experience a statement of a larch plantation at forty years old yielding a clear profit of £548, 15s. per acre.

With a belief in the preceding statements, any person finding their larch plantations to come far short of them, are led to think and speak of their own as a failure. The writer may here state his own experience. He has not found any considerable crop of larch in value within 50 per cent. of the preceding statements; and,

at the same time, he believes that he has seen as good larch plantations as are to be found in Scotland, and these, by competent judges, are considered quite successful productions, and pay at least equal to any other crop the soil produces. Very few writers who make a prospective statement of the value of a crop of larch, take into account all the impeding circumstances, hence the many false conclusions. It is only by present observation of what *is an existent crop upon the ground* that a true knowledge of its value is ascertained.

The first account of larch disease, of which the writer has a personal remembrance, occurred at Thirlstane, in Ettrick, Selkirkshire. The manner in which it appeared, as described, was by the foliage becoming brown early in summer, and afterwards the branches and tops of the trees died. This occurred about thirty years ago. In the beginning of May 1846, a frost occurred in the south of Scotland which browned many larch plantations, especially those in districts predisposed to frost, such as Chisholm on Borthwick Water, Stobbs on Slitrig Water, Wolfelee on Rule Water, and Sinton on Ale, &c., &c. The effects of that frost were seen for several years afterwards in the withered ends of the branches and dead tops of the trees. In after years, when larches were observed to decay, it was considered the manifestation of injuries sustained by the frost of 1846. Many foresters who then believed that frost was the cause of failure still do so at the present day. They can only be justified in their views assuming that they have only taken notice of that form of disease produced by frost. A young larch plantation, then eight years old, situated in a glen upon the Marquis of Lothian's estate near Jedburgh, suffered much from a frost which occurred in April 1859. The trees in the bottom of the glen, which was rather wet, were nearly all killed, and those which escaped were all less or more injured, while those on the tops of the banks on either side, about 60 to 80 feet higher altitude, escaped without harm. Experience has proved that it is much safer to plant Norway spruce in damp, low-lying districts liable to late spring frosts. Frost may therefore very properly be classed amongst the agents destructive to larch. The foliage of larch is very tender, especially early in the season; indeed, not excepting the beech, it is easier injured by severe blasts than any other tree in the forest. Cold easterly winds occurring in May or June frequently render the larch as brown as if it were frosted. So much so is this the case, that some foresters, whose observations have been chiefly confined to larch within the influence of the Frith of Forth, Moray Frith, &c., maintain that larch disease is alone due to *severe* or maritime exposure. In the past summer a severe easterly wind prevailed in the north of Scotland, between the 15th and 20th of May, which left the larch, where exposed to the north-east or east, quite red, and in some

cases the trees upon the outside of the plantations have their branches and tops killed, leaving it doubtful whether or not the trees will recover. All along the coasts of the shires of Banff, Moray, and Aberdeen, the larch has been twice during the past summer, in exposed places, quite defoliated. This is not the effect altogether of the sea air, as larches ten miles inland have also suffered, though not to such a degree.

If the soil is good, and the tree otherwise healthy, it may struggle on and attain a fair size and medium age; but when the soil is cold, or otherwise such as to produce a weakly tree, the likelihood is that it will die prematurely, and if not, it will continue unsightly and uproductive of wood.

Some years ago the writer observed a plantation in Tweedside where the larches were pruned of a large proportion of their branches; and on inquiry of the reason, was informed that it was believed the branches contracted disease, and that pruning was done with a view of preventing it.

The writer thinned a mixed plantation on one occasion, and in order to relieve some hardwoods he cut off or shortened a quantity of larch branches, and on examining the plantation two years afterwards, found the shortened branches making fresh shoots, and the trees had an improved appearance; but this undoubtedly arose more from the additional room afforded, and the admission of sun and air, than from pruning. On the Marquis of Lothian's estates at Mounteviot, Ferniehurst, Oxnam, &c., and also at Cortachy and Airlie Castles, the property of the Earl of Airlie, and at Drumlanrig Castle in Dumfriesshire, the chief residence of His Grace the Duke of Buccleuch, and several other places, the foresters prune off all the dead branches from the larch; and to this there is no important objection, though from the orifice left in the trunk where the branches are broken (instead of sawn off), the rosin and turpentine occasionally oozes out, but when the trees are healthy, little or no harm arises from this circumstance, and the trunks grow cleaner without them.

A farmer in Strathspey planted some larch trees around his garden when he was a boy; the trees in time grew up, and the branches overhung his garden, which suggested pruning, which he did. Two of the number not overhanging so much as the rest were left unpruned; and at the present time, when the trees are sixty-four years old, the unpruned trees are more healthy, and contain more than double the quantity of timber the others do. If the branches of healthy larch are foreshortened moderately, it will do little or no harm, but evidently no good can arise from pruning in any form to unhealthy or diseased trees, unless perhaps in such cases where blasting winds have destroyed the vitality of the ends of the branches; in such cases snag

pruning will induce fresh shoots, or at all events remove the unsightly dead parts of the branches.

Some foresters attribute much of the larch failure to confinement of the trees, keeping them so close together as to destroy the vitality of their lower branches. Of this view there appears scarcely room for division of opinion; the rule seems to be, to keep the latter in life till the heartwood is fully formed with which the branches are connected. The shedding of the branches should never supersede the forming of the heartwood. The importance of branches, and their uses in developing a tree, are too well known to require further comment.

One circumstance of considerable weight ought not to be overlooked, namely, larch in its native countries receive no such aid as the pruning-knife. If pruning, therefore, were essential to health and development, such trees as those at Dunkeld, Monymusk, Kippenross, Castle Menzies, &c., would undoubtedly have come short of the perfection they have attained.

Again, it is maintained that all the diseases of larch are engendered in the nursery, either by crowding the plant in the nursery beds, or stimulating their early growth by strong manures. All nursery-grown plants, however, are by no means crowded, neither are they all forced by manure, although the first planted larches in this country, being grown in the London nurseries, were probably so raised. In selecting the plants for small plantations, choice is generally made of trees which have stood open and clear of each other in the nursery; but as it has been shown to the writer's satisfaction, that the best grown specimens fall a prey to disease as well as those less favoured, and even self-sown plants, though standing as single specimens grown free from all artificial manures, fall a prey to disease along with those otherwise raised and planted amongst them.

Strong and exciting manures are decidedly injurious and objectionable, and ought to be carefully avoided with larch. Diseased seed is also regarded by some as the cause of disease in the trees grown from it. It is maintained that a strong analogy exists between plants and animals, and that the offspring inherits the constitution of the parent, be it healthy or otherwise. The result of sowing diseased seed appears to the writer to be, either no plant produced, or a small and weakly one. In the latter case, time and attention may restore it to strength and vigour which, if once attained by natural and proper means, there appears no good reason why it should afterwards relapse into a state of degeneracy and disease. If the diseases of plants are hereditary, we may assume that each species of disease will propagate its own kind; hence, in sowing or planting from seeds taken from trees variously affected, we

must expect the plants after their kind. For example, a collection of seed is made from trees affected with various forms of disease, and some also quite sound. If the theory of hereditary disease be correct, a crop would occupy the ground as promiscuous as were the diseases of the seeds: one tree affected with dry rot, another by its side with ground rot, one tree affected with blister, another close by it with *Coccus laricis;* and in the centre of a group which have died off suddenly, one or two are in perfect health. The reverse of all this is the case. However mixed the trees are when planted, subtle disease attacks them all alike or in groups.

It is maintained by some, that only seeds procured from trees thoroughly acclimatised produce plants hardy enough to withstand the rigours of our seasons, and declaim the practice of growing plants from foreign seed. Considerable importance is attached to the acclimatised plants; but little is known as to what takes place with a larch tree when undergoing the process of acclimatising, or how far the original nature of the plant has been changed, or its constitution rendered more hardy by the climate of the country. In the absence of corroborative proof in support of the above view, the writer discards it, believing, as he does, that plants which were raised from imported seed are better, or, at least, equal to any that have been grown from what is termed acclimatised seed.

Many, on the other hand, hold the opinion, that sound trees can only be grown from imported seed, and contend that the action of the pollen in local plantations is such as to corrupt the seed, that the pollen of diseased trees is conveyed to those that are sound, and thereby contaminate the seed. They, too, point to the first introduced larches, the best yet grown, in support of their views. It is, however, an undeniable fact, that thousands of trees grown from foreign seed become diseased, and many of the Duke of Athole's first planted larches were affected with blight and other diseases.

It is maintained by some, that to grow larch sound, it should be grown as single trees, or at least they should never touch each other, because, as soon as the branches touch, disease is gendered. Single trees are pointed out as proof of such opinion, but it is scarcely necessary to say that thousands of single trees may be seen almost anywhere quite diseased. It is, however, beneficial to larch to give its branches free and full scope.

Deep planting is also looked upon by many as the cause of disease, and they point out trees where the roots are near the surface as the soundest and most healthy, while others whose roots are deeper in the ground are affected with ground-rot. The benefit of ebb over deep planting is twofold.

First, The roots are larger and of better quality when near

the surface, being better carbonised; and, *second*, the admission of air and light to that part termed the neck of the plant, thereby exciting it to grow in a way superior to others not so exposed. Deep planting upon a slope is not so injurious to the trees as it is upon flat ground.

The practice of mixing pines and spruce with larch confines it too much, thereby causing that insect called the *Coccus laricis* to infest it. Too much confinement in low places (especially damp ones), soils too rich with manure, and exhausted muiry soils, are all producing causes of *Coccus laricis*. Whatever the amount of damage to the trees is, as occasioned by this insect, is difficult to say; but one thing is certain, that noble specimens of trees now exist and plantations flourish which were at one time much infested with *Coccus laricis*. The writer's opinion is, that the presence of *Coccus laricis* shows that something is wrong with the tree, but as soon as it becomes vigorous in growth the insect leaves it, being not the cause, but an attendant or consequent of disease. Newly planted trees (though healthy), and others of sluggish growth, are both subjects of the insect in question.

In the larch, as in other plants raised from seed, there are considerable variety, and in *this varicty*, it is supposed, are concealed the plants liable to be diseased. The red flowering larch is by some considered hardy enough to endure the climate and other unfavourable circumstances, it being a native of the Alps in Switzerland; while others assert, quite the reverse, that the white variety is best adapted for planting in this country, it being a native of Tyrol. This difference of opinion arises from the fact that, under certain conditions, both varieties fail or succeed. The success is not, however, due to the *varicty*, but to the soil in which it is favourably planted. The writer is prepared to point out trees of every shade of colour of flower in a sound and healthy condition, and also to show every variety in various stages of disease.

There appears some difference between trees whose seed was direct from Tyrol, and that of home-grown larch, in their first and early stages of growth. The difference in the nursery ground, especially in the seed-bed, is at times quite obvious, and in other cases quite undistinguishable.

When home-grown seed is plump and well-grown, and that from Tyrol of inferior quality, as sometimes happens, and the two sorts are sown side by side, by way of *experiment*, and in order to compare the two sorts together, the difference is so small as scarcely to be distinguishable; while in other cases, where similar trials have been made, and the seed happens to be of opposite extremes of quality, in such cases the difference is so obvious as to produce an honest impression that the species of larch are different. Good sound Tyrolese seed produces plants several days earlier than Swiss or Scotch seed.

When the plants grow older, the marks of distinction become fainter, till at last they quite disappear; and though a good deal is said about the superiority of the Tyrolese seedlings, nothing is heard of the older trees, or pointed out in the mixed forest.

An example of this appeared in a plantation on the estate of Invercauld, Aberdeenshire, which was planted by Mr Morrison, nurseryman, Elgin, in 1854. One of the conditions in the contract was to plant a certain quantity of Tyrolese plants in stated parts of the enclosure, Those parts are at the lower end of the plantation confronting Balmoral Castle, and about half a mile distant from it, and quite observable from the Deeside turnpike road. In August last the writer examined very minutely the larches in this plantation, now thirteen years old, and on comparison of the Tyrolese groups with those of Scotch produce, taking soil, situation, altitude, &c., into account, he left the plantation quite unable to say which had the superiority, or whether or not there was any difference between the two sorts.

On viewing the plantation from the county road, three of the Tyrolese groups appear much in advance of the others, but on entering the plantation it is found that this appearance is only produced by the rising ground on which they are situated. The greater part of the larches in this plantation are in a very thriving condition, both those from foreign and home-grown seed. The only exceptions are weakly plants overgrown by stronger ones; such overgrown plants are black in the bark, of a sooty appearance, and soil the hands on touching them.

The foliage on such sickly trees is of a pale green, and covered with *Coccus laricis*. On the hillocks alluded to, both Scotch and Tyrolese plants are in vigorous growth, with scarcely any sickly plants amongst them, but where the larch and Scots pine are mixed, there are many sickly plants of the former species.

To the writer there appears so very little difference between the Scotch and Tyrolese larch, that all practical operations should be conducted (in planting) as if they were one and the same sort of plants. If not identical, they are very closely allied, to each show no reliable difference.

Low temperature in the soil is very hurtful to newly-planted larch, especially in a northern aspect; and older trees growing upon it soon die in consequence of decay of the roots. It is probably owing in some degree to the temperature in the soil that paring off the turf, previous to planting, is of such decided advantage to the growth of the trees.

Burning rough herbage, previous to planting, is also found to be of great service in promoting the early growth of the trees. Hoeing and raking the surface of the ground, where such is practicable, also tends greatly to their welfare.

The way in which deep planting proves injurious to the trees

is probably by placing their roots at a depth beyond the immediate action of the solar rays. The writer made some experiments with larch (three years transplanted) in a nursery. In planting, he put each alternate row two inches deeper than the other row, and found as the result that 30 per cent of the deep-planted trees died, while the others all lived. The experiment was made on several soils, and it was found that deep-planting on rich black loam and that of tenacious clay were nearly alike, while very few died upon light dry soil, sand, or gravel.

It is a settled question with many persons, that freely circulated water in some way applied to larch is all that is needed; but when asked in what way it should be applied, the answer is seldom forthcoming. It seems well to endeavour to correct this misapprehension, for although water may be near well-grown trees, it is not from the water or from wet soil that the tree derives its nourishment. It is nourished and sustained not by the water, but in spite of its presence. It is from other favouring circumstances than these that the tree attains size or longevity.

Drainage has its strong advocates, who think and act as if open drains would make larch grow. Wet ground is drained and planted, the trees flourish for a while, are seen so flourishing, and so inspiring confidence, convey the result to others, and thus the impression is spread abroad. On clay-drained ground the larch, after flourishing for a period of about fifteen years, dies suddenly, and all about the drains is forgotten. Or some one thinks the two-foot drain not deep enough, and ascribes to that circumstance the cause of failure, recommending, from his own experience of *failure*, a two and one-half foot or three feet drain.

On looking at a plantation with drains in it, it must be obvious to the least observant how well the trees grow along the margins of the drains, being often, at ten years old, 15 feet high, while the general plantation is only 7 feet or 8 feet high. This superiority of growth is at once attributed to the drainage, which leads to erroneous conclusions throughout of its being (almost) entirely due to another cause explained thus. The earth excavated from the drains is sometimes laid upon one side and sometimes the other, as it happens to answer the hand of the workman; and it is *upon the excavated earth* that the plants so well flourish. It is due to the loose open soil, and not to the drainage (proper) that superior growth is to be ascribed.

Drainage, as formerly stated (unless upon moss), can benefit the growth of larch very little, because wet clays and such soils as truly require draining *are* not, even though dry, suitable to larch, hence should be planted with other trees.

In proof that the superior growth in drained ground is due *only to the loose dry soil* excavated from the drain, and to no

other cause, look at the two margins of the drain: on the one side is the earth, with its luxuriant crop; on the other, with only a three feet drain between them, is a poor stinted growth, with no loose earth to grow in.

Some persons maintain that dry soils are as injurious to larch as wet ones are. This is not borne out in the writer's experience. It is true larches die on dry soils, but it is not *simply* on account of the soils being dry that they die, but because of some deleterious or obstructive substance being in the way of the roots. Either the subsoil is pan, or the soil may have been exhausted by preceding crops of similar or different kinds. One description of exhausted soil is met with in moorlands which is fatal to larch; it is termed a deaf soil, and in it the roots at an early age lose their vitality. The manner in which larch decays in this sort of soil gives rise to the belief of its contracting disease, through fungi, of the spongioles of the roots. Such soils are impure, hence unfit for larch. Lime applied to such soils previous to planting might be of some benefit, but in the meantime it is much safer to plant spruce or poplar.

Larch as a succeeding crop succeeds much the same as others do. But as ground cleared of a crop of trees requires in general both draining and trenching, it is after this is done that the ground is in readiness for another crop.

Wet clay soils are admitted without dissent to be fatal to larch, and yet upon such soils larch is not only planted, but promises to do well for a time, and then speedily dies off. The cause of this is pretty clear. In the first stage of growth the roots are upon the surface, and the under herbage thin, so that they have the advantage of solar heat. Afterwards the roots dip into the cold and wet soil, and those roots that extend upon the surface are matted over with a rank, deep-rooted herbage, which herbage probably also impoverishes the soil and obstructs the roots of the trees. Whether the manner in which a wet clay soil proves fatal to larch be fully understood or not, experience shows that it is inexpedient to plant larch upon it, however well it may grow at first.

The preceding are the principal theories and opinions entertained respecting the causes of failures of the larch; but without following in detail the various forms of disease, and tracing them through their various stages, the writer will conclude this part of the subject by adding briefly, that it is his opinion that all the diseases embracing what is generally known as the larch disease, are either due to low temperature in the soil, the result generally of superabundant water—a soil too compact, stiff, or hard for the roots to spread or dip in—the sudden transition of the roots passing through a good strata of soil into an inferior one, or entering a soil either naturally destitute, or exhausted of those elements

which constitute its proper food, or brought into contact with poisonous ingredients, which either destroy the absorbing power of the spongioles of the roots, or contaminate the fluids of the tree after absorption.

The commercial value of larch is very great; scarcely any product of the soil is more valuable, and certainly no species of timber is so much sought after and so highly esteemed as larch. The price of larch has uniformly decreased since the year 1809, when the Duke of Athole obtained from 3s. to 3s. 6d. per cubic foot for his.

In Scotland, as in other countries, the prices are now much more equalised than in other years. The prices now obtainable for larch timber throughout Scotland (I might say Britain) varies from 10d. to 1s. 6d. per cubic foot. As a rule, the further north larch is dearer and oak cheaper, though to this rule there are exceptions.

The great demand for larch at the present time is for railway sleepers, props for mining purposes, and fencing of all kinds, especially stakes for farm fences. The bark of larch under forty years old is valuable for tanning, and pays from 20 to 25 per cent. upon the labour, minus felling the trees.

It is sometimes asked what proportional duration the sapwood of larch bears to the heartwood. The question is difficult to answer directly, but may be understood thus: A larch tree twelve years old will stand as a paling-post three years, at the end of which the heartwood is quite decayed. At twenty years old the root-cut will stand as a post four years, and the heartwood one year longer, or is one-fifth more durable than the sapwood. At forty years old the sapwood of a larch-post will stand five years, and the heartwood would stand good ten years, hence the heartwood is twice as durable as the sapwood. There is considerable difference in the quality of sapwood, but not nearly so much as in the quality of the heartwood.

The returns from larch plantations are very variable; in some cases they have paid well, in others they have proved a great loss. The districts where larch have paid best are upon dry, porous land, precipitous or flat, but generally thin and poor. Some have concluded that the north country is better adapted for larch than the south. In this there is no obvious difference, save what soil and situation produces. There are equally as good larches in the counties of Sussex, Surrey, and Kent, as there are in Inverness-shire, Ross, or Sutherland; but in the latter counties good larches and larch plantations are more numerous.

In Wales there is much fine larch of all ages, not exceeding one hundred years, and diseases are little known save upon slate rock, and even there only on clays, wet and cold. Throughout North Wales, wherever larch has been planted on dry soils, and

duly thinned, the crops have proved remunerative. The accounts from Ireland are also favourable, and diseases are all but unknown; the exceptional cases are upon soft, boggy ground, where its roots decay, as in Scotland upon certain mosses and cold clays.

No proprietor in Scotland has suffered so much from diseased larch as His Grace the Duke of Buccleuch, and the reason is that extensive tracts of damp clay land have been planted. In Liddesdale, and the southern parts of Teviotdale and Tweeddale, larch in general grows indifferently, owing doubtless to the cold and clayey soils that prevail. It is also owing to the cold clays in Roxburghshire, Selkirkshire, Peeblesshire, and Dumfriesshire, that so much disease has occurred amongst the larch. In the above named counties, where the soil is sufficiently dry to maintain life, the trees frequently survive to forty years old, and contain from eight to ten cubic feet of red, hard, and most durable wood, which, though not of large dimensions, pays well to grow for fencing purposes, and common farm buildings, including cottages.

There is a red clay soil overlying sandstone, and sometimes porphyritic rocks, which proves fatal to larch, but just *so in proportion* to its wetness. This soil predominates in the neighbourhood of Melrose, in some parts of Jed Forest, in Annandale about Drumlanrig, and some parts of the Lothians. There is, however, not only in every county in Scotland, but probably in every parish, patches of ground capable of growing and sustaining good larch, even in those districts regarded as unsuitable, at same time in every locality there are soils entirely unsuitable to grow larch timber; so that exceptions may justly be taken "*pro* and *con*." The writer, though anxious to make his statements clear and understood, feels he has but imperfectly performed the task.

Some statements are doubtless introduced which may appear irrelevant to the subject, but as they have all contributed in some degree to enlighten the question to the writer, he concludes they may so act with others, and in conclusion he remarks—

First, There are no important phenomena connected with the diseases of larch but are clearly traceable, either directly or remotely, to defects of the soil, situation, or climate.

Second, The diseases of larch are confined to districts, localities, or classes of soil, rather than to individual trees. The well-grown larches are in certain groups or localities by themselves, and so are diseased ones (speaking generally), a circumstance that could not readily occur from other cause than that of the soil.

Third, The soils inimical to larch are essentially different, and produce different diseases, *e.g.*, wet ground produces ulcers; rich soils, *Coccus laricis;* low situations attract frost; severe and

maritime exposures suffer from cold cutting winds, while the foliage is young and tender; exhausted soils cause a general drying up of the tree, and ultimate death; stiff clays produce sluggish growth, and superabundance of fruit; soils dry on top and wet below, produce pumping or ground-rot. Such are some of the connections between soils and diseases.

Fourth, The essentials of soils calculated to produce health, rapid and vigorous growth, and sustain trees till seventy or eighty years old, are briefly these:—Soil dry, free, and open, to a depth of 3 feet; virgin, or soil rather poor (not exhausted by cropping).

Fifth, Situation elevated, or freely exposed to evaporation, but protected from cutting winds while in foliage.

Sixth, The absorption, by the roots, to be maintained according to evaporation by the branches; this is attained by thinning, so as to preserve the proper number of branches clear.

Seventh, The crop of larch when 6 feet high (for timber) should not exceed 1200 per acre. If destruction by game, &c., has necessitated closer planting, an early thinning, say at three or four years, should be adopted, and the crop reduced to the above number.

Eighth, Thinning should not be continued after about thirty years old, and the crop, according to description, cut down at fifty, sixty, seventy, or eighty years.

Ninth, The crop to stand as timber at thirty years of age, should not exceed 300 trees per acre upon good deep soil, and between 250 and 200 upon poor thin soil. It is not essential, in order to secure a proper crop, that the trees be either perfectly regular as to distance, or of equal size, but in thinning this should be aimed at as desirable.

Tenth, The layers or zones of wood should be about $\frac{1}{8}$th of an inch thick till forty years old, $\frac{1}{9}$th till fifty, $\frac{1}{9}$th till sixty, and $\frac{1}{10}$th till seventy or eighty years.

Eleventh, The form of a larch tree, grown for large timber till nearly forty years old, should be conical, and its girth *in inches* a little above ground should correspond to its feet in height. Say at forty years old it girths 50 inches, at same time it should stand 50 feet in height; at sixty years old, its girth at 10 feet from the ground in inches should be equal to its height in feet; and at 20 feet from the ground, when seventy years old, its girth in inches should correspond with its height in feet.

Twelfth, After thirty to forty years old, larch plantations, where the soil is dry, may be depastured with sheep during summer; and even in winter they do no damage, except in severe storms they bark the exposed roots, hence must be excluded when the latter circumstance occurs.

Thirteenth, According as the lower branches loose their vitality

they should be taken off with the pruning saw, and the ground cleared of them for the mutual benefit of the trees and pasture.

Fourteenth, In thinning the aim should be to have upon the ground 1200 trees at ten years old, 900 at fifteen, 600 at twenty, 450 at twenty-five, and 300 at thirty years, to stand as crop.

Fifteenth, Larch, in the form of thinnings, and below thirty years old, should be peeled for the sake of the bark: the operation pays from 15 to 25 per cent., minus the cutting down and pruning.

Sixteenth, The north of Scotland is better adapted to grow larch than the south; the reverse is the case with regard to England, the south being better than the north, owing to the soil.

Seventeenth, Larches, save in cold clays and upon moor-pan, with a few other unimportant exceptions, even when they have not attained timber size, have in general paid the proprietors equally as well, if not better, than any other crop of wood.

Eighteenth, There are three points to be attended to with the larch, viz., freedom for its roots, which are soft and tender; keep the roots dry and cool, but not cold; and protect the foliage from cold easterly winds.

Nineteenth, To grow larch well, it should be by itself or among hardwoods, but not mixed with evergreens, except to thin out early.

Twentieth, The disease termed "blister," being the result of superabundance of moisture, is in many cases susceptible, if not of cure, at least of arrestment, by drainage and clearing off the herbage, which attracts moisture.

REPORT ON LARCH FORESTS.

By John Grigor, Forres Nurseries, Forres.

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There is no subject connected with the growth of timber that stands more in need of close investigation than that of the formation of larch plantations in this country. In some districts we see plantations of this tree advance vigorously, readily assume a timber size, hold on, and with judicious thinning yield the greatest bulk of valuable timber of any tree adapted to our climate. On the other hand, we find plantations apparently under similar circumstances advance but slowly, or if vigorous for a time, fall back after severe weather, display dead twiggy branchlets, and become affected with every disease to which the tree has a tendency. Numerous instances of this sort give no hope of improvement, and the young trees in some cases can only be removed from the ground at a cost nearly equal to that of the formation of the plantation. Such is the diversified and precarious state of the larch plantations in Scot-

land at the present time. In order, therefore, that the reader may the more clearly apprehend the leading causes of success and failure, it may be expedient that I should give a short detail of the rise and progress of the tree in this country.

Introduction of the tree.—It is well ascertained that the larch was known as a rare tree in the Apothecary Gardens of London, during the third decade of the seventeenth century. Evelyn, in 1664, mentions it a flourishing and ample tree at Chelmsford; and in 1731 large trees stood at Wimbledon, and yielded an abundant crop of cones yearly; and plants were then common in English nurseries. It was in the year 1738 that Mr Menzies of Meggernie brought small plants of the tree from London, and left five at Dunkeld, and eleven at Blair, as presents to the Duke of Athole. These sixteen plants, no doubt, formed the source from whence sprang the great proportion of the larch plantations throughout Scotland during the last and early portion of the present centuries. And although it was, no doubt, the most important accession to the arboriculture of the country that occurred during the century, yet it appears to have been a reintroduction of the tree, for, according to Headrick's Agriculture of Angus, the larch was first planted in Scotland shortly after the middle of the seventeenth century. He says, in 1813—"It is generally supposed that larches were first brought to this country by one of the Dukes of Athole about eighty or ninety years ago. But I saw three larch trees of extraordinary size and age in the garden near the mansion house of Lockhart of Lee, on the northern banks of the Clyde, a few miles below Lanark. The stems and branches were so much covered with lichens that they hardly exhibited any signs of life or vegetation. The account I had of them was that they had been brought there by the celebrated Lockhart of Lee, who had been ambassador to Oliver Cromwell at the Court of France soon after the restoration of Charles II. After Cromwell's death, thinking himself unsafe on account of having served an usurper, he retired some time into the territories of Venice. He there observed the great use the Venetians made of larches in shipbuilding, in piles for buildings, and other purposes; and when he returned home he brought a number of larch plants in pots, with a view to try if they could gradually be made to endure the climate of Scotland. He nursed his plants in hot-houses and a greenhouse sheltered from the cold, till they all died, except the three alluded to. These, in desperation, he planted in the warmest and best sheltered part of his garden, where they attained an extraordinary height and girth."* Now, it is so

* General View of the Agriculture of the County of Angus or Forfarshire, drawn up for the consideration of the Board of Agriculture, by the Rev. James Headrick, minister of Dunnichen. Edinburgh: Neill & Co. 1813.

far confirmatory of Headrick's report, that there exists an old tradition respecting the Dunkeld trees having been imported from a foreign country, nursed in a glass-house, and afterwards treated as Mr Lockhart is said to have treated his larches on the banks of the Clyde. In their absence, however, it is likely to suppose the story of treatment would descend to, or be engrafted on, the next oldest trees of the species in the country; but be this as it may, it is worthy of notice, that although the larch plants of the first introduction, taken direct from their native country, had existed for a long period, yet they became of no value in a national point of view, compared to the reintroduction of the tree by plants, the produce of English seed, and consequently hardier, and better adapted to the climate of Scotland. This leads to *acclimation*, which I have found to be of the greatest importance to several species of coniferæ, and to the larch in particular. Yet the influence of acclimation is denied by some, and doubted by many; and it is quite clear that the great majority of planters pay no attention to the subject whatever. Few men have done more in behalf of botany and vegetable physiology than the late Professor Lindley; yet, as far as I have seen from his writings, he had little or no faith in the powers of acclimation.* But, as his statements are made respecting agricultural and annual crops which have no existence during winter, perhaps his remarks should not be held as relating to trees. The stems of the Indian cress, kidney bean, mignonette, potatoes, &c., are succulent and annual, and no climatic influence could reasonably be expected to inure them to the frosts of winter, or render them hardy to any perceptible extent. With the larch, however, it is very different; in a congenial soil and climate, with judicious management, it sometimes displays its top shoot at the height of 100 feet, after having stood that number of winters. I am not prepared to say the influence of acclimation will extend, making the tree more and more hardy in proportion to the number of successive generations that are produced by seed sowing; it may be that a few generations of the tree in this country will render it as hardy as its nature will admit of becoming. The plantations with which I am surrounded, and from which I draw my experience, are generally very healthy, and probably are

* Dr Lindley says:—"But if no good evidence can be produced of plants having become acclimated by repeated sowings of their seeds, the facts on the other side are numerous and conclusive. The Peruvian annual called Marvel of Peru or *Mirabilis*, the common Indian cress or *Tropæolum*, the scarlet running kidney bean, the Tomato, the mignonette (an African plant), the Palma Christi or *Ricinus*, all natives of hot climates, have been annually raised from seed ripened in this country, some of them for two hundred generations, yet have in no appreciable degree acquired hardiness, but the earliest frosts destroy them as formerly."—*Agricultural Cyclopædia*, p. 26.

composed of the third, fourth, and fifth generations of trees from the Duke of Athole's woods.

Where bare moorland adjoins some of these hardy woods the young seedlings may be seen in acres, from self-sown seed, like the indigenous growth of young pines beside the native forests.

I understand that, in the end of the last and during the first twenty years of the present century, the Perthshire plantations were the chief source of supply for the nurseries throughout the country, and as far as I can learn *little* or *no* foreign larch seeds were imported *during that period.* In course of time, however, duties were relaxed, international communications were opened up, and foreign seeds have now for many years been imported to the extent of many tons yearly, yielding plants in the Scotch nurseries of certainly not less on an average than twenty millions annually. The four years succeeding to 1860 were too wet and cold for the larch seed crops in this country, and Scotch seed could only be obtained to a small extent in the more favoured districts, from old woods, where some of the acclimated trees were being felled; so that during the last few years fully double the above stated number of larch plants from foreign seeds must have been produced in Scotland.

I have frequently had the opportunity of seeing the difference between the plants grown from Scotch seed and those grown from seeds imported from the continent, and I find it is very great indeed. I have experienced it many years since, and have attributed the dead twiggy state of some plantations to the more tender nature of the tree from imported seed. Now, I do not mean to affirm that all the plants grown from imported seed are equally tender; but I think, from the specimens that have lately come under my observation, that during the last twenty years the evil has greatly increased, and that the plants from imported seed generally during that period have become more and more unsuitable for the climate of Scotland. This I account for by the extended cultivation of the tree of late throughout warmer parts of the continent, in France, Germany, and Prussia, from whence the chief importations are made. No doubt, in the native habitat of the tree, it is to be found far hardier than in a cultivated state, in low and warm situations; for the influence of acclimation extends, no doubt, in both directions—to the endurance of heat as well as of cold, and the seed collectors may be expected to gather them from the trees most convenient, though inured to heat, when they can be obtained at their doors. Now, let it be observed that these remarks respecting the gathering of the seeds in warm localities are only conjectural, having no experience as to where the seeds are gathered, farther than having seen many larch plantations in warm climates, throughout many parts of the continent, and

believing that plants from imported seed are not now equal in respect to their endurance of cold to what they once were. I can account for the difference in no other way. As to the existence, however, of a very great difference in hardiness between larch plants from home-grown seed and that grown from seed recently imported, I can speak positively from a practical knowledge of the fact extending over many years.

A very noticeable instance of the difference between the two sorts appeared in November 1865, at a time when I would have least expected it to be apparent; for in this district the autumn was excessively warm, and so dry that water became scarce, and I would have expected that weather so ripening in September and throughout October would have assimilated the plants, at least as to appearance for the time, but the case was very different. I had a few plants of both sorts two years old; they stood in the same seed-bed, sown at the same time in the same quality of soil, and with treatment exactly the same; yet, at a distance as far as the plants were visible, the difference was quite distinct in colour. Those from home seed had their foliage thoroughly ripened, of a mellow yellow or golden colour all over, with shoots well ripened, and the terminal buds visible, full and plump. Those from foreign seed had their foliage quite green on the extremities of the shoots, and ripened foliage only on the lower portion of the growths, which were soft and succulent near the top, having the terminal buds concealed in the green twist of the foliage, such as is usually seen on the young larch shoots in the end of September. These symptoms of the want of hardiness may therefore be said to appear on the plants of imported seed even in the best of seasons.

A person unacquainted with the nature of the plant, and the influence of seasons, would be apt to suppose that if the plants were too tender, the severity of winter would clear the ground of them in early life, so that there would be no chance of their remaining to die by the influence of frost in a more advanced state in the forest; this, however, is not the case so uniformly as might be expected. Many are severely injured; but plants in nursery lines often renew their tops or leading shoots. Removal, by transplanting, into the nursery or into the forest has a tendency to harden the plant, and to sustain it for a short time against the frosts of a severe climate.

The period of the larch's greatest vigour is that at which it is most likely to suffer; that occurs near the time it is about to assume a timber size, or from 12 to 20 feet high, more or less in some plantations, dependent to some extent on the nature of the soil and the seasons. The period is readily seen by referring to the concentric circles on the root of a felled tree, in the same description of soil. The failure of larches at this period of their

growth, in many districts throughout Scotland, arises from their being too tender; and the display of dead wood they present, with a few young shoots emerging here and there from their stems, is just the symptom which all other half-hardy plants present when frost-bitten. This casualty frequently occurs in the vicinity of very healthy larch woods standing on the same description of soil, showing that it arises not from disease, but from the want of that hardiness in the one case which is possessed in the other.

The want of hardiness at the present time is apparent in the *Cedrus Deodara* in a similar manner; the casualty arrests the tree at the time of its greatest vigour, the top fails, and dead branches appear. The evil is seen with singular uniformity throughout the country.

Before leaving this subject, I should have been glad to have been able to support my statements by referring to authors who have written in favour of the necessity of acclimatising or inuring plants to a climate in which they are not indigenous; but I have only found very few that notice the subject. It appears, however, that Sir Joseph Banks and Dr M'Culloch both ably advocated that doctrine. The late King of the Belgians may also be quoted as a firm believer in the importance of having plants acclimatised.*

I have frequently heard that, during his tour through Scotland about the year 1817 (then Prince Leopold), his remarks on the larch plantations in the Highlands awakened an interest for the tree among some of the landowners; and afterwards, in forming a large forest of the tree in Belgium, his Majesty gave special orders to have the plants from the nurseries of Messrs John Grigor & Co., Forres, giving the orders twelve months before requiring the plants, each year, during three years, until the forest was completed. These plants, being all the produce of Scotch-

* Leopold of Belgium, whose loss we lament in this country almost as much as do his own subjects, had a character for shrewdness which the subjoined extract from a pamphlet of our friend Professor E. Morren of Liege, will go towards justifying. Speaking of the progress of horticulture and botany, the good old king remarked on the benefits conferred on the world at large from the alliance of the two branches of science, and expressed his opinion that "we need not pay so much attention to the discovery of plants likely to be useful as food for man, as to those capable of being employed as forage plants. The human race spread throughout the world must be in possession of nearly all the plants profitable as sources of food for man; but with reference to those indirectly useful there is more scope. Moreover," continued the sagacious monarch, "it is not necessary to ransack the whole world; China and Japan are the most important countries for us in this particular. In them is to be found a very ancient civilisation and skilful culture, carried on in a climate like our own. It is more advantageous to seek what we want under such circumstances than to begin anew with wild nature. We shall find in those countries plants adapted for cultivation and for our requirements, offering less resistance to our proceedings than those that we procure direct from their native wilds. Centuries are required to acclimatise plants."—*Gardener's Chronicle*, 1865, p. 1178.

grown larch seed, formed at least part of the third or fourth generation of the tree in Scotland. There can be no doubt that the reason why acclimatised plants of the larch are so seldom sought after is, that the great difference is not known; it is seldom their advantages are brought before the planter's notice; but once having seen the great contrast in the hardiness of the one compared to that of the other, it forms a subject not to be forgotten. Then, no more would a judicious planter allow the plants from foreign seed to be inserted in his plantation, in an elevated or exposed situation, than he would any other species of half-hardy trees.* He then sees that in most cases, acclimation is the grand basis of health in the tree, forming the difference between success and failure, life and death. Most people acquainted with the commonest operations in gardening have experienced the great difference in cauliflower plants subjected to the influence of cold during winter compared to those protected in heat. Even our hardiest weeds, that spring up under glass in a high temperature, suffer greatly when exposed to the severity of weather in the open ground; this influence, which is so perceptible in the succulent plants of a season, is, with respect to trees, assuredly transmissible by seed to their future generations; and it is likely to suppose that that hardiness, or tenderness, will be the more or less fixed according to the length of time or the number of former generations the tree had been subjected to such temperature or climatic influence.

I had lately a consultation with the owner of one of the largest and longest established nurseries in the west of Scotland respecting the tender nature of the larch of late years, both in the nursery and in the forest. He said, so far as the nursery was concerned, he was well aware of the fact, from dear-bought experience, that for several years his crops grown from imported seed had been so severely damaged by frost, that on an average of years only about a fourth part of the seedlings had escaped with their tops; that in future he was fully resolved to sow none but Scotch-grown seed, which produced plants far hardier than that from foreign seed; and in the event of a failure of Scotch seed, he would be obliged to purchase young seedling plants raised in a better climate than that which his ground possessed.† Great as are the

* I observe from a paper presented to the Botanical Congress this year, on the raising peaches, nectarines, and other fruits from seed, by Mr Thomas Rivers, Sawbridgeworth, he states, that by repeated generations from seed, they are produced of a more hardy nature than the old sort, and that he has more than one proof of the fact. He adds—"I may be accused of enthusiasm, but I look to the future for new races of fruits with qualities far superior to the old, and the trees of so hardy a nature as to resist some of the unfavourable tendencies of our climate. I have formed this opinion on the solid basis of observation during a lifetime devoted to the cultivation of fruit trees in all stages of their growth."

† The difference also between *Scotch fir* plants (*Pinus sylvestris*), from continental seed and seeds grown in Scotland, is also very marked. A nurseryman

advantages of international commerce in many commodities, it is to be feared that the importation of the seeds of plants that are required to stand in exposed situations is neither to benefit our forests nor our fields. Whatever may be the fate of annuals or the crops of a season, that law in nature which I have experienced to stamp its influence so deeply and legibly on the trees of the forest, may be expected to be impressed, at least to some extent, on the perennial and biennial plants of the field.* Of course it cannot be expected that plants, under the most skilful precautions, will be exempt from frost or the casualties of seasons. The hardiest indigenous plants are not always exempt from injury; their recovery, however, is speedily effected by seasonable weather. Late spring frosts are more fatal to the larch tree in this country than any other casualty, and this usually falls with remarkable uniformity about the second week in May. In nursery gardens it is easily averted with respect to seedlings, by inserting twigs of evergreens or clippings of beech hedges with the leaves on in the seedbeds; and although these do not exactly cover the plants, yet their shade is generally a sufficient protection.

In parts of Yorkshire, where late frosts are very common, some of the landowners, who nurse their larches a year before planting them into the forest, prefer to insert the young seedlings into the nursery lines as late as the month of April; by this means the newly transplanted plants are less vigorous during the critical period, and by that means are uninjured.

In the forest, however, no screen can be employed for its protection, though much may be done by precaution, in adapting the tree for successfully withstanding the inclemency of a country in which it is an exotic.

On transporting the larch into the forest, it is not necessary that I should say much. Various modes are usually adopted throughout the country, dependent on the state of the ground, and the description of the herbage that overspreads it, the strength of which also regulates the size of the plants to be employed. In Scotland I never saw any necessity for planting larch above the age of four years—that is, two years seedling, two years transplanted, and that only when furze or other herb-

in England informed me, that even in his grounds in Derbyshire, where the two-year old seedling plants of both sorts stand in the same lot, after an ordinary winter, those from foreign seed are brown and withered by frost, while, to use his own words, "those from seeds from the Highlands of Scotland are as green as a leek." I know this is the case in cold exposures, and that it accords with the experience of many cultivators throughout Britain.

* "The unfortunate circumstance which attends clover is its being extremely apt to fail in districts where it has been long a common article of cultivation. The land, to use the farmer's term, becomes *sick* of it. After harvest he has a fine plant, but by March or April half or perhaps more of it is dead."—*Farmer's Calendar*, p. 155.

age is apt to overcome and injure smaller plants. In England larger plants are frequently employed; but in Scotland the removal of a larch at a size beyond two or three feet commonly checks its progress, so that a smaller and younger plant would more than overtake it. Besides, there is an idea among the most experienced planters, that removing the larch of a large size has a tendency to increase the disease in the tree known by the name of *pumping* or heart-rot; and from several examples that have come under my notice, I think the opinion is well founded, particularly with respect to land that has been manured and under tillage. According to the laws of vegetable physiology, the *spongioles*, or terminal parts of the roots of a plant, have the power of selecting proper food, and in rejecting injurious substances, at least in ordinary circumstances, to a very great extent, so long as they are in a healthy and perfect state. But when the roots are cut or mutilated, they are rendered capable of absorbing any fluid substance with which the mutilated part comes in contact; hence large plants, whose roots are generally pruned, or to some extent curtailed by removal, are apt to imbibe substances which engender myceleum, for which the tree has a tendency. There are more larch plants used for forest plantations in Scotland, at the age of two and three years, than at any other. Those of two years are commonly one yearseedling, one year transplanted. Few planters in Scotland have, during the present century, planted more, or understood the subject better, than the late Sir William G. G. Cumming, of Altyre, Bart. He informed me that when he came into possession of his estates, the best larches on the property were ascertained to have been planted out when they were only one-year old seedling plants. Soon afterwards, in forming a plantation, I planted from twenty to thirty acres of bare heath, on a hazelly gravel soil, with one-year seedlings; and although after doing so the plants were hardly visible on the surface, yet in a few months they emerged above the heath; and in autumn, when their leaves began to fade, the plants displayed their well-ripened foliage, and were seen in their proper places, and in a few years could not be distinguished from those that were twice their age at the time of planting; and there is this advantage in inserting the plants when young, that they arise in a *broad stocky* figure, with a justness of proportion which is the life of a larch.

On thinning larch plantations.—This is an operation which is very much neglected throughout Scotland. I believe there is no yearly loss attending the cultivation of any other crop in this country which bears any comparison to it. It would be a much more judicious mode of procedure to insert only half the usual number of plants per acre, than to neglect the timely thinning. But since early thinnings are everywhere valuable for such

purposes as hurdles, or sheep flakes, posts to wire fencings, &c., it is surprising that neglect or want of skill is so prevalent in plantations of larch. It is a tree that cannot exist in a healthy or vigorous state without a large display of foliage; for the massiveness of its bole, its vigour, and its permanence are in direct proportion thereto.* Where larches are grown for the sake of small timber, such as hop-poles, sheep flakes, or fence-wood, it is necessary to have them closely planted, and by confinement adapted for the intended purpose; but it is a mistake to suppose that plantations trained for such purposes, with a space between the trees of only three, four, six, or eight feet, where they must be drawn up, destitute of lateral branches to a great height by confinement, can ever be profitably cultivated for the more important purposes of heavy timber, such as ship-building or for railway sleepers. All heavy larch timber requires early thinning and ample space; and it is easy to see when the trees approach so close to one another that they begin to weaken and subdue their side branches. It is then that thinning is indispensable, if large timber is to be obtained. For want of timely thinnings the plantations of Scotland are to a great extent comparatively worthless. The loss to the country arising from this circumstance must be estimated anually at least by tens, if not by hundreds of thousands of pounds sterling. The husbandman who would fail to single out his turnips or mangolds, the crop of only one season, would be talked of as worse than unskilful, while the ruin of the crops of a lifetime is often passed by without remark. A few practical details will place this matter in the clearest light.

From thirty to forty years ago I formed some extensive plantations, and some of them I had not seen till very lately since the time of their formation. One plantation in a remote quarter I was anxious to inspect. It is now thirty-six years old, and about twenty acres of it appeared to me to be composed of the finest soil for larch I had ever met with,—I therefore planted this portion of the ground with larches chiefly. With the view of reporting on larch plantations, I lately visited this estate. The spot in question formed a gentle slope in a ravine along the banks of a mountain stream. The soil is a brown loam, of a good depth, and the surface was of a thin peaty substance, overspread with heathy vegetation. It was planted with two-year old larch plants, with a slight mixture of about a fourth or fifth part of Scotch fir. The plants were *notch*, planted nearly four feet asunder, which gives nearly 3000 to the imperial acre. Judging

* "A grove of crowded saplings, elms, beeches, or almost any deciduous tree, when thinned, will throw out new lateral branches, and in time recover a state of beauty; but if the education of the fir (or larch) has been neglected, he is lost for ever."—*Lander's Gilpin*, vol. i. p. 173.

from the apparent suitableness of the soil, I expected a remarkable instance of the value per acre of young larch timber. I was accompanied by an experienced forester, who is in the constant practice of selling timber, and, on nearing the plantation, the party had the advantage of the accession of a wood merchant from the saw-mills of the district. A narrow track or road to the peat moss, about nine or ten feet wide, which was reserved at planting time, had become so completely obscured by the growth of trees that it could not be recognised, and the remote corner was reached with difficulty. I found that, on account of a succession of proprietors and managers, the thinning of the plantation, though performed to some extent, had not been practised sufficiently. The Scotch firs had been nearly all removed, but the larches stood far too close. The dead, grey, twiggy branches formed an almost impassable thicket, and extended up to the height of from twenty to thirty feet on the stems of the trees, surmounted by a canopy of waving foliage, in some instances sixty feet in height. I found the average distance of the trees to be about 7 feet, or about 900 trees per imperial acre. We heard the sound of the woodman's axe at the time, but in his absence the plantation was irreparably ruined. The trees were far too tall for their girth, and, for want of side branches, will not readily swell or acquire girth. They are adapted for propwood, posts for wire fences or other palings, and valued at 1s. 6d. to 2s. each; or if sold in one lot, they would readily fetch L.60 per acre. The trees have become top heavy, with roots very contracted through confinement; they are now apt to be blown over on being relieved by thinning. They are just in that precarious state which makes it difficult to say what should be done with them. The extent of the part referred to is from twenty to thirty acres; and, under the treatment they have received, the goodness of the soil has accelerated their ruin. Had the spot in question stood on the outside of a forest, or had it been contiguous to arable land, no doubt the cutting down of the space at once would be the most profitable mode of procedure; but as it stands surrounded by many hundred acres of wood, the difficulty of establishing a succeeding crop of young trees among the old roots, and exposed to the ravages of vermin, makes one hesitate.

Another plantation of the same age (thirty-six years), composed of equal numbers of larch and Scotch fir, planted by the same mode, stood on the lower slope of a hill, and at an elevation similar to the plantation formerly described, of about 400 feet. This plantation was of easy access: it stood along a public roadside, and was very much under view. There the management was all that could be desired. The trees, chiefly larches, stood

at from twelve to fifteen feet apart, or about 280 trees per acre. They ranged from 50 to 60 feet in height, and displayed a justness of proportion, and a vigour that is seldom surpassed. The very largest to be found measured 24 cubic feet, and were fit for railway sleepers, and valued at 20s. each. The best Scotch fir measured 15 cubic feet, but the average of both kinds was far underneath these dimensions. The value per acre here was estimated at from L.70 to L.75 as they stood, a price at which the plantations could have readily been disposed of in lots of twenty or thirty acres each.

Now, it is to be observed that the difference in the present value of the two plantations, viz. L.15, represents only a small portion of the loss sustained by the management of the first-mentioned plantation; for it could easily have yielded other L.15 or L.20 for thinnings, even had they been removed at an early age when the wood was of little value, which would have had the effect of leaving the plantation much more valuable than it now stands. But it is to the future of these plantations that we must look for the difference in respect to the value of management. The first, or crowded plantation, is not likely ever to become more valuable than it is at the present moment. The trees in the other stand in the full vigour of early life, possessed of ample foliage, and of that justness of proportion indispensable to the most profitable growth or speedy formation of cubical contents, with the prospect of yielding 100 trees during the first twenty years, which may be estimated at not less than L.60, leaving the plantation at the end of that period containing about 150 trees per acre, worth at least, on an average, 40s. each.

In looking at the future of the other plantation, our experience only points to a loss in the case of its being allowed to stand (as the interest of the present value would exceed the value of its future growth), and to disease, and wind-fallen trees of little comparative value.

In the event of a clearance at once being made, there follows the outlay of re-establishing the plantation—a work always difficult on ground where wood has been recently removed, expensive and uncertain when surrounded with wood where vermin abounds—consequently the difference in value of these two plantations at the age of sixty years must be very great. Yet the least remunerative is attended with great profit compared with the yield of the waste land of similar quality throughout the country.

The ground of both plantations before planting was a common heath or sheep pasture, and not worth more than 1s. or 1s. 6d. per acre yearly. The formation of the plantations cost under

20s. per acre, including plants, planting, and fencing; no drains were required.

As to the yield from thinnings, I can give no accurate account; but, no doubt, in the best managed part, the revenue up to the present time has been more than enough to repay the formation of the plantation, and to give a rent for the land equal to that of the best cultivated soil in the district. It already appears quite certain that at the age of sixty years the judiciously thinned plantation will have yielded more than three times the value of that raised in a thicket.

In a Highland district, I planted thirty-five years ago 500 imperial acres with larch chiefly, but mixed with Scotch fir. Only very few transplanted plants were used,—two-year old seedlings of both sorts prevailed. The larches were grown from Scotch seed, and were consequently acclimatised; the Scotch fir were from seed of the native forests in the north of Scotland. The plants were all inserted by the notch system of planting, giving nearly 3000 per imperial acre, or placing the plants a little less than four feet asunder. The formation of this plantation on the whole, including fencing, plants, and planting, did not exceed L.1 per imperial acre, and the previous yearly value of the ground—500 acres of bare heath soil—was only about 1s. per acre, or L.25 rent. The larches being generally vigorous, the thinnings have been chiefly formed by the removal of Scotch fir, although in some parts each kind prevails according to circumstances. I am unable to give an account of the revenue derived from thinnings, but they are believed to have been sufficient to defray all expenses, and to have yielded a rent equal to that of good arable land. This plantation is altogether very vigorous, and though only about half-grown, its *present* value of timber has been estimated by competent wood merchants at L.31,600, or L.63, 4s. per imperial acre.

The introduction of railways throughout the country has given rise to a constant demand for railway sleepers; and as there is every prospect that the demand will be permanent, those entrusted to the management of woods can hardly commit a greater mistake than to imagine that railway sleepers can be produced at any age, in close plantations where the trees stand at distances of only six or eight feet asunder. Yet the common practice too frequently goes to indicate a belief in this fallacy, and sometimes it is even asserted by writers on forest management. This is greatly calculated to mislead, for no such productions can ever be met with.

Judicious thinning protects the tree very much against the influence of disease. Trees that become top-heavy for want of being early relieved, are apt from the influence of winds to have their roots broken and injured, although they are not thrown

over, and the dead and decaying parts of broken roots very frequently engender the rot or myceleum, which being exactly in contact with the living root, is absorbed into the trunk. Again, trees for want of thinning are reduced to too scanty a supply of foliage, so that after a severe summer frost, when the foliage becomes inoperative, there is a marked difference between the rapid recovery of a tree well furnished with branches and one that is sparingly supplied; in the former case, the casualty often disappears in a week or two, while in the latter the new foliage is more slow to break out; and this being the condition of the tree most favourable for the larch aphis (*Coccus laricis*), this insect prevails, and often destroys not only the growth of a season, but, in the case of trees previously enfeebled by confinement, the attack becomes altogether ruinous.

The difference in the health of larch plantations in Scotland in a favourable year, compared with an unfavourable, is very great. 1865 was far better than any of the four preceding years. Casualties will come to many kinds of trees in spite of every precaution; yet precaution can effect much, while cure is seldom or never applicable to the disease of a forest.

Respecting the produce of our fields, the efforts of the Highland and Agricultural Society have already effected much. With animals of every kind the greatest care is now taken to have the stock of a pure and undegenerate order; care is bestowed also in the pedigree and cultivation of our various agricultural crops, and though only the growth of a season, the vigilance exercised in the propagation of the various strains of excellence has brought numerous kinds to a high state of perfection. The inquiry of the Society into the formation, progress, present condition, and prospects of larch forests, cannot fail to be productive of the best results, the importance of which is greatly enhanced by the length of time the crop occupies the ground, therefore no tree is more worthy or stands more in need of investigation.

Numerous specimens of the tree, fully acclimatised, and of the soundest constitution, are felled for railway sleepers and other purposes every winter, where seeds are commonly readily obtained, and when care is taken in procuring such of worthy extraction, no tree, with the exception of the native Highland pine, is adapted to yield so much to the general wealth of our country. With respect to both, the spirit is needed which animated that patron of planting and prince of English letter-writers, Horace Lord Walpole, when he wrote inviting a friend to Walterton, Norfolk, May 29, 1745. After giving a description of his residence, he says—"It is encompassed with a most delightful and innocent array of vegetable striplings of my own raising, which are already (though but of twenty years' growth from the seed) with a

becoming rivalship stretching and swelling themselves into timber. They are all of noble and worthy extraction. . . . If this description pleases you, come, my dear friend, come and partake of the beauties from whence it is drawn."*

REPORT ON THE RECLAMATION OF WASTE LAND ON THE FARMS OF LOCHEND AND SYSTER, IN THE COUNTY OF CAITHNESS.

By James Purves, Lochend, Thurso.

[*Premium—The Gold Medal.*]

The farm of Lochend, the property of the trustee of the late W. J. J. A. Sinclair, Esq. of Freswick, was entered to on a nineteen years' lease from Whitsunday 1851. It then contained 260 acres of arable land, 40 acres of waste ground contiguous to the arable, and 600 acres of hill pasture. Under the lease, L.400 at 6½ per cent. interest was advanced, to be expended by the tenant in completing the drainage and enclosure of the arable land.

In 1859 the drainage and enclosure of the old arable land was thoroughly completed, and the 40 acres of waste ground was reclaimed by drainage, enclosure, and liming, the arable land being thereby increased to 300 acres in regular rotation. A new agreement was then entered into, whereby, for the further improvement of the property, the lease was extended to nineteen years from Whitsunday 1860, and L.400 at 6 per cent. was advanced to the reporter, to be expended by him in the reclamation of 82 acres of waste ground, added to the farm, lying near the new steading, which had been removed from the old grange to a more central situation for increasing the area of the arable land. The reclamation of the 82 acres was completed in 1864. In 1865 the rest of the property, viz., Syster townlands and mill, fell out of lease, and it was then arranged that the whole property should become one possession. The reporter agreed to expend L.400 in the reclamation of 43 acres of waste ground lying immediately above the 82 acres formerly reclaimed. The 43 acres were divided into two fields, and thoroughly drained in winter 1865–6, and were enclosed and had a road of access made to them in the summer of 1866.

The estate of Lochend and Syster is situated in the parish of Dunnet, at about an equal distance of four miles from the Pentland Firth on the east, and the Atlantic Ocean on the west of Dunnet Head, and about six miles from Dunnet Head Lighthouse, the most northerly point in Scotland. The estate contains 1814 imperial acres or thereby, whereof, including the 125 acres to be reported upon, 425 acres are now arable,

* Coxe's "Memoirs of Horatio Lord Walpole."

and, as will be shown, the improvement of 260 acres additional is in progress, which will make 685 acres arable, 65 acres under small tenants, 129 acres sandy solum of loch, and 935 acres of hill pasture, surface drained, and carrying a stock of Cheviot ewes. The arable land falls to the S.E. and S.W., which is a good exposure; but, unfortunately, the estate was bounded on the south by flow-moss, on the east by the Loch of Syster, and on the west by the Loch of Hallan. The cold of the wind from the north is always intense, and it could not blow over the estate from any other "airt" without carrying cold vapour along with it from either of the lochs, or from the flow-moss. The wind prevails from E. back to S.W. The cold from the N.E. over Syster Loch was so severe that turnip sheep could not be prevented from stiffening, or taking chronic rheumatism in their joints, in spring. The cattle of the small tenants next the loch also often stiffen, and one of them lost a cow by it in 1864. The crops on the estate were always a week or ten days later than on neighbouring farms, which was caused to a certain extent by the cold referred to. In fact, it appeared desirable, for the amenity and benefit of the estate in every respect, to have the loch drained. The water of the loch was formerly kept up for supplying Syster mill. The mill was taken down at the last tenant's out-going in 1865, and as the loch was the sole property of the estate there was no prohibition on its drainage. The proprietor allowed the water to be cut off after the nature of the solum was ascertained, the levels taken, and expense calculated, and the loch was run dry in 1866 at a cost of L.84, whereby 269 acres of solum have been exposed, over 150 acres of which are mud, and will make first-class arable land when underdrained and thoroughly azotised, and the remainder being sand will become good and sound pasture for sheep. Since the solum has been exposed and its value ascertained, the proprietor has obtained a loan of L.1500, sanctioned by the Drainage Commissioners, for the under-drainage and reclamation of 150 acres of the loch's solum, and for the drainage of 110 acres of townlands and waste ground still unimproved on Syster. The lease of the estate has been extended to nineteen years from Whitsunday 1867, the reporter being bound to pay the interest charged on the drainage loan, and to expend L.400 of his own capital on enclosures, making roads of access, &c. When this reclamation is executed the improvement of the estate will be complete, and there cannot be a doubt of the ultimate advantage thereof to the property, whether it pays the reporter or not. Triptolemus Yellowley propounded true experience when he declared that "the carles an' cart avers mak' it a', an' the carles an' cart avers eat it a'; so that improvers dinna get rich."

Reference is made to the extended improvement now in pro-

gress, merely to show that the reclamation of the 125 acres of waste ground between the two portions of the estate of Lochend and Syster, which is now specially to be reported of, was a necessary part of the improvement of the estate for connecting the arable land by bringing into cultivation waste ground intervening, and in proximity to the steading, without which it could not have been complete as a whole or done systematically. The extended improvement when executed may form the subject of a future report.

The surface area of the county may be classified as—1st, Flow-moss; 2d, Heath ground with more than 18 inches of decayed vegetable mould or humus over the clay or rock; 3d, Heath ground, with from 2 inches to 18 inches of humus; and 4th, Green ground, formed by alluvial deposit from disintegration of the rocks and rain-washings of the soils at a higher level. The cultivated land, extending to about one-fifth of the area of the county, has been principally taken from the third class.

The shore sides have been long in cultivation, but the interior has not been so. The granges of the mains' farms, which up to about 1830 were generally in the occupation of the proprietors, can be easily distinguished passing through the county, as they are situated on the dry eminences of its undulating surface, the land attached to them having the advantage of the natural fall for carrying off the superfluous rain water. The soils on these farms have been accumulated to considerable depths by the former practice of carrying midden feals from the out-fields and commonties; and with all deference to modern improvement, the truth of the Caithness saying, that "the auld rigg is the best ane," must be admitted, although in many cases it has been made so at the expense of its poorer neighbours. Reclamation has been extended principally by working from the old mains land as a base of operations. The introduction of thorough drainage has enabled a large proportion of the fourth class of low-lying, and swampy ground to be put into cultivation, which is next in value to the old arable, and in some cases equal to the best of it. A good deal of inferior ground, having less than 6 inches of mould above the subsoil, has been reclaimed in extending the area of cultivation by straightening lines and squaring fields. Strangers are often disgusted with the poor, hungry, and unequal appearance of much of the land after it is turned over in spring and before it is covered with vegetation. A Morayshire man, who held a farm for less than seven years in the county, pertinently remarked, "Yer aacres, aacres! I've seen mair lan' on yae aacre in Murrayshire than on twenty o' yer Caithnuss aacres." But there is an extraordinary virtue in the Caithness clay, which in early autumn is equally deceptive, as there is generally then a more luxuriant vegetation on the ground than there is climate to mature.

The subsoil is generally a friable sandy stratified clay, altering in density from being easily workable with the tramp spade to being almost impervious to the pick. The percentage of sand in the clay is always large, but varies in different localities. There is not a vestige of clay in the county sufficiently plastic to make bricks or pipe tiles, which have all to be imported. The subsoil clay varies in depth from less than a foot to over six feet, and rests either on boulder clay or pavement rock. The colour of the clay shades from light brown to yellow and dark red, and as a general rule the darker the better. The richest description of red clay is seen in the county at Kilminster and Ackergill, in the parish of Wick, the property of Sir George Dunbar, Bart.

The same nature of soil and subsoil prevails over Orkney, but there the subsoil clay is richer and the land better quality on an average. The finest specimens of rich red subsoil clay are seen in the island of South Ronaldshay, partly the property of the Earl of Zetland and of Mr Heddle of Melsetter; in Stronsay, on the property of George Traill, Esq., M.P., and others; and in Sanday, on the farm of Stove, the property of David Balfour, Esq. The extraordinary fertility of a large proportion of the Orkney land cannot be surpassed, and with a seaboard equal in extent to the east coast of Scotland, affording an unlimited supply of shell sand and seaweed, Orkney is capable of being made one of the most productive districts of the kingdom.

There is often an iron-pan below the mould in the upper stratum of the subsoil. Where iron prevails, the deposit from the water is very injurious to drainage, by filling up the openings and bursting the drains. In this case the drains should be sunk as deep as possible; leaders with large openings put into every hollow, and the regular gradients of incline in the bottoms of parallel and leading drains strictly adhered to. Of course, this is applicable to all drainage. The water often springs from fissures in the rock, and is tapped between the subsoil and boulder clay. The drainage cannot be executed perfectly at any fixed depth; but all drains ought to be 3 feet 3 inches deep, except where rock intervenes, and there cut down as near that depth as possible.

The principal desiderata in reclamation of waste ground in this county are thorough drainage; trench ploughing, with three or four horses to mix a portion of the subsoil with the vegetable mould above it; subsoil ploughing, to break the pan, allow the water to sink, &c.; and lastly, a top-dressing with calcareous matter, either in the form of lime, marl, or shell sand.

The statement of the subject in two divisions, one of 82 acres and the other of 43 acres, is adopted, because the reclamation was executed at two different periods under different contracts, the accounts being kept separate, and because the 82 acres portion

has been through a rotation, whereas the 43 acres section has only been once cropped.

The 82 acres lot was divided into four fields, as follows :—

No. 1.—22 acres, 10 acres of which were the solum of a peat moss from which the peat had been cut, with irregular blocks left uncut, about 3 feet high, here and there over it, with 2½ feet of subsoil clay above rock. The other 12 acres were the worst description of waste ground, covered with short heather, having not more than 6 inches of decayed mould above 2½ feet of the densest subsoil clay lying on pavement rock.

No. 2.—23 acres, 17 acres of which were the same as the 12 acres portion of No. 1, and 6 acres formerly in cultivation, but very wet, with 2 feet of soft subsoil clay, impregnated with iron, and lying on rock ; this portion had to be drained at every 15 feet.

No. 3.—20 acres, and No. 4.—17 acres, 15 acres extending across both fields were the same as the 12 acres in No. 1 and 17 acres in No. 2. The 22 acres remaining formed a ridge running across the extent of both fields, 10 acres of it covered with stunted heather, having about 3 inches of heath mould above raffy clay, and 12 acres formerly cultivated with same subsoil. The last 22 acres were the only portion naturally dry, and which had not to be drained regularly at every 30 feet.

The rent paid for the 82 acres is L.8, 10s., or within a fraction of 2s. 1d. per acre.

Expenditure in Reclamation.

Imperial Chains.				
1586·55	Drains and open Ditches, as per detailed statement, ...	L.380	13	6
12·00	Roads of access, as per do. . . .	24	7	0
144·00	Flag fences, conduits, and 5 gates, complete, per do.	55	2	0
		L.460	2	6
L.400	advanced by proprietor, at 6 per cent., .	L.24	0	0
60	reporter's capital to be returned during lease, at 10 per cent., ...	6	0	0
		L.30	0	0
	Money rent payable, ...	L.8	10	0
	Interest charge, to pay up principal and interest, .	30	0	0
	Yearly rent charge, nearly 9s. 5d. per acre,	L.38	10	0

Field No. 1 was drained entirely with stones, the others with pipe tiles, 2 inches bore being the smallest used; and most of the leading drains were done with stones, either built or coupled.

The actual date of entry to the ground was Whitsunday 1860 ;

but after the agreement was completed, the drainage of No. 1 field was pushed on, and it was ploughed at Martinmas 1859, and sown with 5 bushels of oats per acre, top-dressed with 2 cwts. of Peruvian guano per acre, sown and harrowed in along with oats in 1860. There was no rent paid for this crop.

In July 1860, the heather ground in Nos. 2 and 3 fields was ploughed. No. 2 field, 23 acres, was sown with oats in 1861, 5 bushels oats and 2 cwts. Peruvian guano per acre on first furrow. No. 3 field, 20 acres, was trench-ploughed over, along with No. 1, 22 acres, and both wrought in for turnips in 1861. The portion of moss ground in No. 1 was top-dressed with 6 tons of shell sand per acre, after the land was reduced, and before the turnips were sown. Both fields got 1 cwt. Peruvian guano, 1 cwt. dissolved bones, $1\frac{1}{2}$ cwt. bone meal, and $1\frac{1}{2}$ cwt. bone dust, along with 15 tons of farm-yard manure per acre.

Field No. 4 was top-dressed on the heather with 5 tons of shell marl in 1861, ploughed and sown with 5 bushels oats, and 2 cwts. Peruvian guano per acre in 1862. Field No. 1 was sown down to grass with oats in 1862. No. 3 was sown with oats in 1862. And No. 2 was trench-ploughed in winter and wrought in for turnips, the heather portion of it being top-dressed with 5 tons of shell sand per acre, before the turnips were sown with same manure as Nos. 1 and 3 got.

In 1863 No. 2 was sown down to grass with an oat crop, No. 3 was subsoil-ploughed, No. 4 trench-ploughed, and both were wrought in for turnips; No. 3 was top-dressed with 5 tons of shell sand per acre before the turnips were sown. Turnip manures as above.

In 1864 Nos. 3 and 4 were sown down to grass with an oat crop.

Nos. 1 and 2 have both been taken up this season (1867) after No. 1 has been four years in grass, and No. 2 three years, and both will be subsoil-ploughed next winter. Nos. 3 and 4 have been two years in grass, and remain so for another year.

The average produce in oats of the first crop of the 82 acres was about $3\frac{2}{8}$ qrs. per acre, and of the 102 acres after turnips $3\frac{6}{8}$ qrs. per acre, with little variation in either case, except that field No. 4, which was marled, yielded most, but lightest per bushel. The shell sand seemed to make no difference on the oat crops. The crops on the new land ripened each year eight or ten days earlier than those on the rest of the farm, and weighed about 2 lbs. per bushel heavier, averaging nearly 42 lbs. The oats were such a fine sample that they were always used with advantage in seeding the old land.

The turnip crops were comparative failures. They were always too late in being sown; the new land, requiring a great deal of working, was invariably postponed till the rest of the break was laid down, and the first week in July was generally well through

before the sowing was finished. The shell sand had been too recently applied to tell on them effectually, but the benefit was apparent on the portion of field No. 1 first done with it. The line where it stopped was seen at a glance across the drills, the shaws being more luxuriant and the bulbs clean skinned, and as smooth as a globe; whilst the turnips on the undressed portion were sickly looking, knarry, and rough skinned, from which it was deemed advisable not to sow down field No. 3 to grass till sanded and made into turnips again. Field No. 4 was also the best crop of turnips, being about 15 tons per acre, whilst the average per acre of the crops on the new ground was only about 10 tons. This is attributed to the more immediate effect of the marl on it.

The new land as a whole has done uncommonly well in grass. The effect of the shell sand on field No. 1 was most decided. There was not a vestige of clover on the unsanded portion, whilst on that sanded every seed must have grown. The remainder of fields Nos. 1 and 2 was sanded in young grass, the men having no difficulty in ascertaining what was to sand from the difference of the pasture, and though too late for last rotation, the benefit will be got when by cultivation the sand will be mixed with the soil. Fields Nos. 3 and 4 have grazed both years better than the finest land on the farm, and it will be a moderate estimate to average the grazing of the 82 acres at 20s. per acre for each year's grass.

Statement of Cost and Produce.

Cost of Corn Manure per acre.			
2 cwt. Peruvian guano, at 13s. 6d.	L.1	7	0
Cost of Turnip Manure per acre.			
1 cwt. Peruvian guano, at 13s. 6d.	L.0	13	6
1 „ Dissolved bones,	0	7	6
1½ „ Bone meal, at 8s.	0	12	0
1½ „ Bone dust, at 7s. 6d.	0	11	3
	L.2	4	3
Cost of Turnip Seed in fuel.			
100 lbs. Common white globe, at 6d.	L.2	10	0
100 lbs. Fordel's hybrid, at 8d.	3	6	8
100 lbs. Dale's hybrid, at 7d.	2	18	4
	L.8	15	0
Cost of Grass Seeds per acre.			
1½ bush. Ryegrass seed, at 3s. 6d.	L.0	5	3
¼ bush. Italian do., at 4s.	0	1	0
2 lbs. Cocksfoot, at 8d.	0	1	4
2 lbs. Meadow fescue, at 8d.	0	1	4
2 lbs. Timothy, at 6d.	0	1	0
3 lbs. Cowgrass, at 9d.	0	2	3
1 lb. Alsike,	0	1	8
3 lbs. White clover, at 10d.	0	2	6
2 lbs. Yellow clover, at 5d.	0	0	10
	L.0	17	2

Cost.

82 acres	(5 bushels Seed oats, at 2s. 6d.) at 12s. 6d.	L.51	5	0	
82 „	Peruvian guano, at 27s. . . .	110	14	0	
82 „	Grass seeds, at 17s. 2d. . . .	70	7	8	
102 „	Seed oats, at 12s. 6d. . . .	63	15	0	
102 „	Turnip manure, at 44s. 3d. . .	225	13	6	
102 „	Turnip seed, ...	8	15	0	
6 years'	rent and interest charge, at L.38, 10s.	231	0	0	
					L.761 10 2

Produce.

82 acres	Oats ($3\frac{2}{8}$ qrs. at 20s.), at 65s. . .	L.266	10	0	
102 „	Oats ($3\frac{2}{8}$ qrs. at 20s.), at 75s. . .	382	10	0	
102 „	Turnips (10 tons at 6s. 6d.), at 65s. .	331	10	0	
231 „	Grass, at 20s.	231	0	0	
					1211 10 0
					L.449 19 10

of balance in favour of improvements against labour, the straw of oat crops being reckoned of equal value with the farm-yard manure.

The 43 acres reclaimed since 1865 were divided into two fields by extending the lines of Nos. 1 and 2, No. 5 containing 23 acres, and No. 6, 20 acres.

No. 5.—23 acres, 15 acres of which were formerly cultivated along with the 6 acres portion in No. 2, being sharp land of fair quality, but excessively wet, with from 6 inches to 18 inches of a rich soft subsoil clay, lying above very hard surfaced rock, and the remaining 8 acres heather ground, with sufficient mould on same subsoil as above.

No. 6.—20 acres, partly heather and partly green marshy ground, with more mould than any of the other five fields, and 4 feet of rich subsoil clay, lying on boulder clay.

The rent of the 43 acres is L.7.

The serious obstacle opposed to the improvement of this division was the nearness of the solid rock to the surface in No. 5 field, making it difficult and extra expensive to cut the drains sufficiently deep through the rock to render them effectual and permanent.

Expenditure in Reclamation.

Imperial Chains.				
1168·56	Open ditches and drains, as per detailed account, ...	L.334	1	$3\frac{1}{2}$
68·00	Flag fences, with 2 gates, as per do. .	23	17	3
25·00	Road of access complete, as per do. . .	60	10	$6\frac{1}{4}$
		L.418	9	$0\frac{3}{4}$
L.418, 9s.	Capital to be returned during currency of lease, at 10 per cent., . . .	L.41	16	0
	Rent of the 43 acres, . . .	7	0	0
	About 22s. 8d. per acre, . .	L.48	16	0

The cost of the road ought not fairly to be charged against the 43 acres, as it will afford access to the loch solum and Syster ground beyond.

The parallel drains in No. 5 field were put in 20 feet apart, and in No. 6, 30 feet apart, 5 acres of the middle of it being done at every 15 feet. The depth of the whole drains is stated in the detailed account, which shows that the drains in No. 5 were cut down through the rock to a depth of 2 feet 6 inches in the shallowest, and to an average depth of 3 feet. The leader drains in this field had to be cut 3 feet wide to get down against the lay of the rock; and on this account, and the impossibility of jointing large tiles perfectly on a rock bottom, built conduits were put in them, which increased the expense greatly.

The heather ground in field No. 5, and all the ground in field No. 6, was ploughed in summer 1865. Both fields were drained in winter 1865–6. The whole of field No. 5, was shell-sanded and subsoil-ploughed, after being drained and wrought in for turnips last year. The importation of raw bones being prohibited on account of the cattle-plague, the manure given was $1\frac{1}{2}$ cwt. Peruvian guano, $1\frac{1}{2}$ cwt. superphosphate, and 2 cwts. dissolved bones, costing 44s., along with 15 tons of farm-yard manure per acre. The produce was $16\frac{1}{2}$ tons of turnips per acre, which were eaten on with sheep, and the field is to be laid down to grass with an oat crop this year.

No. 6.—15 acres of field No. 6 were sown with 5 bushels oats, getting 1 cwt. Peruvian guano, and 2 cwts. superphosphate, costing 24s. 6d. per acre. The other 5 acres were sown with beans, tares, and oats for soiling, and same manure, the whole on the first furrow. The produce of oats, when thrashed out for seed, amounted to $69\frac{1}{2}$ qrs., weighing 42 lbs. per bushel; about $4\frac{5}{8}$ qrs. per acre. The field was shell-sanded after harvest, and has since been subsoil-ploughed for turnips.

The rotation not being completed, a statement of cost and produce of crops cannot be made in this case.

No charge is made in the statements of cost for cartages, which were very heavy. The tiles were carted from Castle Hill Harbour, $6\frac{1}{2}$ miles distant. The marl from the Loch of Durran, which was drained by the reporter's father in 1850, on the property of George Traill, Esq., M.P., who kindly granted the privilege of lifting it there, about 6 miles distant. The shell sand from Dunnet Sands, about 5 miles round by the road. The rubble stones for drains, roads, &c., and the flags for fences, were raised from a quarry on the farm immediately above No. 5 field.

The corn crops had to be thrashed with the horses, which impeded the work very much, and prevented the extra turnips on the new land from being got down in time. However, on entering into the agreement for the extended improvement, a

fixed ten-horse power steam engine was procured from Mr Robert Bridges, North Berwick, which obviates that difficulty for the future.

The implements employed, in addition to those in ordinary use on the farm, were—

1*st*, Two land-reducers, made by the blacksmith, each formed of an iron plate 7 feet by 3 feet, bored for three rows of sabre-shaped knives, set that each cuts separately, which can be loaded to any weight required by stones above the plate. The reducers were very useful, especially for bringing the first furrow of the heather ground to a sufficiently fine tilth for the oat crop; their advantage being that they cut deeper than the common harrows, and can be drawn across as well as along without tearing up the furrows.

2*d*, Finlayson's Norwegian harrows were used for breaking up the turfs after cross-ploughing for turnips.

3*d*, Subsoil-ploughs made by the blacksmith. The plough consists of a long beam with four wheels attached before a single tine, on the Marquis of Tweeddale's principle, with a shill arranged to confine the draught to the line of the preceding plough furrow, made suitable for two, three, or four horses, as required for the density of the subsoil.

The old land on the farm is enclosed with flag fences, having quickset thorn hedges on the sun side and whins on the other. The new land was thought too poor for thorns; and as whin dressings are valuable for fodder, and a mill for bruising them erected at the steading, it was judged advisable to sow all the new lines with double rows of whins on each side. The whins have grown well, make an excellent fence with the flags, and have a pleasant appearance, but don't give the same shelter that thorns do. They are dressed each alternate year, and the cuttings make good food for horses, from the time they come in from grass to the new year.

The improvement of the 125 acres is complete as to drainage, enclosure, and roads of access. The whole has had a calcareous top-dressing of shell sand or marl. Lime costs from 2s. 9d. to 3s. per boll at the harbours, which makes it excessively dear for agricultural purposes. Shell sand is slower in acting, but has one advantage over lime or marl—it does not require to be repeated. Lime in some form will soon have to be applied extensively over the interior of the county, as turnips and grass are becoming uncertain crops without it.

The proprietor receives the original rent of L.15, 10s., along with 6 per cent. on the L.400 advanced on account of the improvement of the 82 acres, which sum will be paid up, principal and interest, in twenty-six years, or at the expiry of the reporter's lease in 1886. The statement of the cost and produce of the

crops of the 82 acres for a rotation, and of the first crops of the 43 acres, shows the reporter's prospect of being repaid his outlay of—

On 82 acres, ...	L.60	2	6
and on 43 acres, ...	418	9	0
	L.478	11	6

at 10 per cent. during the currency of his lease, and also of a margin for profit on account of the labour of the undertaking.

Exclusive of any prospective rise in the value of land, the original rent, with whole charge for paying up principal and interest on the outlays at the expiry of the present lease, may be assumed as a moderate estimate of the rent of the 125 acres then; and it is evident that the produce would have remained stationary if the ground had not been reclaimed; therefore the profit of the reclamation to the property will, at the expiry of the present lease, stand thus :—

Rent and interest charge on the 82 acres, . .	L.38	10	0
Do. do. on the 43 acres, . .	48	16	0
	L.87	6	0
L.87, 6s. of yearly rental, at 30 years' purchase, .	L.2619	0	0
Less L.15, 10s. original rental, at 30 years' purchase,	465	0	0
	L.2154	0	0

The actual profit of the reclamation to the property is thus shown; but the improvement of the appearance of the estate would require to have been seen to be appreciated. The fact that the reclamation of the worst ground on the estate, above reported of, has led to the extended improvement now in progress, and that it forms a part of the complete improvement of the estate, has also to be taken into consideration.

The extended improvement has been inspected and reported upon by men of skill, who estimate that when it is executed the value of the property will be increased L.5000 thereby. The reporter will use every endeavour to bring out that result; but eight years, at least, must expire before such a report as the foregoing can be made thereon.

REPORT OF THE IMPROVEMENT OF MEADOW PASTURAGE ON PART OF THE CROWN LANDS OF DORRERY, IN THE COUNTY OF CAITHNESS, WITH PLAN.

By JAMES PURVES, Lochend, Thurso.

[*Premium—The Gold Medal.*]

THE reporter entered to the grazings and shootings of Dorrery on nineteen years' leases from Whitsunday 1860. The property

is a detached part of the parish of Thurso, running up between the highlands of the parishes of Halkirk, Latheron, and Reay. It is about eight miles distant from the Crown lands of Scrabster, and seems to have been the summer grazings and shiellings of the barony belonging to the bishopric of Caithness. By the settlement of marches with surrounding properties, it is now curtailed to a narrow strip of ground about nine miles long, and less than one mile in breadth. The lower or north-east end consists of Dorrery mountain and townlands. The upper end embraces the waterfall to the river of Torran from its source to within thirty-five chains of where it flows into the Loch of Shurrery, on the north-west side of the mountain. The river is called the Water of Forss from the outlet of Loch Shurrery to its fall into the sea, five miles west from Thurso. The "Leens of Torran" are ten miles from the sea, and at an elevation of 175 feet. The improvement to be reported of is the reclamation of these leens or meadows from the flooding of the river of Torran.

The ground between the Crown property and Loch Shurrery belongs to Mr Sinclair of Forss, and is called Lamsdale. The reporter, that he might occupy the Crown grazings properly without the expense of a march dyke, endeavoured to negotiate with Mr Sinclair for a lease thereof. They could not agree personally, but made a mutual remit to the local factor for the Crown, who gave Mr Sinclair the rent he wanted, "on consideration that the tenant of Dorrery shall have free liberty to make such cuts as might be necessary for the carrying off the water of the farm of Dorrery, and that without any compensation. A plan of the cutting to be submitted to Mr Sinclair, and approved of by him before the work was proceeded with." The reporter made the necessary arrangements, and procured tools for executing the work referred to, on his entry to Dorrery. But being favoured by Colonel Guthrie of Scots Calder, nephew and a trustee on the estate of the late tenant, Mr Dunbar, with the use of a report on the subject, by James Flint, C.E., in 1831, in accordance therewith he thought it advisable to obtain consent of the proprietor of the ground below Loch Shurrery to widening the loch's outlet sufficiently to give an outflow discharge equal to the inflow of water, and thus prevent the loch from rising 4 feet 6 inches with highest floods. All that was requisite could have been done without interfering with the ordinary level of the loch, and for an outlay of about L.10. This would have lessened the cost of the works above L.57, as a 3 feet narrower channel would then have been sufficient, and embankment would have been unnecessary. A correspondence on the subject was entered into, which delayed procedure with the improvement till 1864, when consent was not obtained, and it had to be executed without enlargement of the loch's outlet.

In 1861–63, the burns that fall into Torran water were cut, and the upper ground surface drained, which brought down the water immediately, and rendered the floodings much more frequent and continuous. In 1863 the flood came down on 18th August, when the hay was lying in swathe, and scarcely as much of it was saved as served the shepherds' cows. Although the flooding several times subsided, the ground never again was safe for sheep that season. Thirty cattle were sent up to try and get some good of it, but they were twice or thrice surrounded by water, and eventually had to be taken round Loch Shurrery and home again. Any one acquainted with the management of sheep stock will understand the impossibility of maintaining a hirsel of ewes under such circumstances. The leens, having been saved on account of the hay portion, were lost, as well as the hay, when at their very best, and the stock were to tide over winter without an opportunity of getting into condition to stand it. But this was not all; for no power could keep sheep on the ground, and prevent them from getting to the leens when the water subsided, on account of the curtailed extent of green ground, and their predilection for leens' grass. The consequence was, that the reporter lost L.800 value of sheep by rot in the two years, 1862–63; and thus found that to go on with the leens unsecured would be ruinous, that to give up the farm after such a loss at the beginning of the lease would be equally so, and that his only alternative was to secure the leens with the least possible delay. Had this been done in 1860 the saving would have been inestimable. The former rent was only one-third of the present, and could be met comfortably with very different management. The ground was under black cattle till within a few years of the reporter's entry.

On 23d March 1864, as soon as the leens were clear of flood water, the reporter had Mr William Reid Tait, C.E., at the ground, who made a survey, and took the levels along the channel proposed in 1860, as laid off on the ground by roanfeals cut on each side. He gave in a plan and section thereof, accompanied by an able report early in April following.

The plan and report were submitted to Mr Sinclair of Forss, who approved of them, but demurred to allowing such extensive cuttings through his ground without relieving his portion of the leens from flooding. This, the levels show, could not be done, as the extraordinary flood-level of the loch and the surface-level in the centre of Lamsdale leen is the same. However, in consideration of the terms of Lamsdale lease, he signed his approval of plan and report on 18th April 1864.

A specification of the works was prepared and estimates advertised for the following week. On 25th July 1864, a contract was entered into with Mr George Sinclair, who undertook to

execute the work for the sum of L.281, exclusive of woodwork of bridges. He agreed to execute the portion between the loch and flooding ground that season, which was done, and the cut carried up, 50 feet wide, four chains through the flooding leens.

The reporter had observed, during the interval from 1860, that the flooding invariably commenced at the upper end, and that frequently in the summer season the leens flooded when the loch did not rise. He ascertained by levelling that with full floods the flood-level of the leens was always higher than that of the loch, the difference of level being least when the wind blew up the loch, heaping the water to the upper end, and greatest when it blew down; varying from 13 inches to 33 inches. He saw that with all floods there was a rapid current through the neck of higher ground between the leens and the loch. The channel from the leens to the loch was formerly tortuous, and only 20 feet wide; whilst the channel of the river, above the leens, averaged over 22 feet. It was therefore evident that, by straightening and widening this throat below the leens, the flood-level of the leens would be reduced nearer to that of the loch. On 20th October 1864, the most tremendous flood of sleet and rain ever remembered fell over all Britain, by which much damage was done in England. The flood-water in the leens poured into the new cutting from all sides, carried down to it a bridge and temporary embankment for taking the shepherd across, and broke in from the old channel. When the reporter saw the effect thereof, he was satisfied that his object would be accomplished, and that the leens belonging to the Crown could be secured thoroughly. Formerly the flood-water was perfectly still, merely rising as a bank for the current, confined to the sinuous old channel, through which it circled and eddied from the surface to the bottom, and bubbled and boiled from the bottom to the surface again, flowing much more rapidly than above or below the leens. This it did, by flooding the leens to such a height, that the weight of water gave the velocity required to discharge the same quantity of outflow as of inflow water through the tortuous channel, nearly double the length of a straight line. The old channel through the leens was narrowest in the lowest ground, being only 14 feet wide in some places, and where narrowest the pools were deepest; evidently showing that the lateral weight of still water bore the current downward, wearing out the bottom and saving the sides. Though the flood-water in the leens looked level, the levels showed one inch of fall on every two chains, from upper to lower end.

The reporter being determined on securing the leens of Torran thoroughly and permanently, on consideration of the levels and observations stated above, concluded that, with any flood that might fall, the river water could be conveyed into the loch with-

out flooding the leens, on the aqueduct principle—that is to say, embanked on each side, and that the whole weight of water, confined to one channel, would make the most rapid discharge, an outfall for the surface water of the ground on each side having to be provided, as afterwards explained. The contractor and the reporter made a remit to Mr David Smith, C.E., for ascertaining the additional cost of altering the course of the remainder of the channel and embanking, that the work might be executed as above. He awarded—

Cost of altering course of channel, . . .	L.32 12 6
Cost of embankment, ...	24 15 0
	L.57 7 6

And it was done accordingly.

Reference is made to the annexed copy of plan and section. The section shows, by a cross line, where the extraordinary flood level of the loch strikes Lamsdale leen, and consequently the extent to which the leen is affected by the flooding of the loch. In 1864 the channel was straightened, and made 50 feet wide up past the cross line, and thereby the flood-level of the leen at that point was reduced almost to that of the loch. The distance from the cross line to the point B, at upper end of flooding ground, is 57 chains. The section shows a rise on the surface of the ground, above the extraordinary flood-level of the loch of 3 feet 8 inches on this distance. An embankment, 4 feet high, has been added, which makes 7 feet 8 inches at the point B, giving more than 1½ inch of fall per chain. Since Mr Tait reported on 13th April 1866, the embankment has been carried down from C 3 to C 1, and the loops of the old channel at C 3 and C 2 filled up, the water being thereby confined to the new channel, 50 feet wide. This was done to restrain the whole weight of the water to one channel, on account of sand deposits beginning to be formed where the water diverted into the old channel. The sand has since been carried completely away.

An embankment commences at C 1, and is carried up to high ground at D, on the east side of new channel. This embankment secures Lamsdale leen and lower portion of Torran leens from the flood-water confined thereby to the new channel. From C 3 to C 2, a cut carries down the surface water which falls into the new channel at C 1. Lamsdale leen, which is still affected by want of discharge for the flood-water from the mountain, has been enclosed by a wire fence along with the tumulus, and makes a park in lambing time, and is saved for hay afterwards. Another embankment commences from the high ground at H, and is carried round the west side of the new channel to the high ground at F. A catch-water ditch conveys the hill water into the new channel at E below H, and into the river above the

leens at F. The upper portion of Torran leens is thus hermetically secured from the flood-water of the river and the surface water of the hill. The rainfall during floods is contained in the cut-off loops of the old channel. At G there is a self-acting sluice, which shuts when the flood-water rises, and opens when it falls.

The new channel is 50 feet wide to above cross line on plan, and the remainder is 35 feet. From C 1 to E it is carried along the west side of leens, between the embankment and the high ground, the water of which falls directly into it. From E to D it is carried across the leens between the embankments, and from D to B it is carried along the old channel, on the east side of the leens between the embankment and high ground, the water of which also falls into it. Thus a channel of sufficient capacity has been made, that carries down the water on the east side of the upper portion of the leens, across between the upper and lower portions, and down the west side of the lower portion and Lamsdale leen to the loch. All risk of flooding is prevented by the embankments, which confine the flood-water between them where the channel crosses the leens, and throw it out against the high grounds above and below. The lower embankment is carried down past the leens nearly half way to the loch. Since the works were executed in 1865, flood-water has only once or twice risen to the embankments, and the highest time, when the channel was obstructed by ice, only to an average height of 15 inches up the embankments.

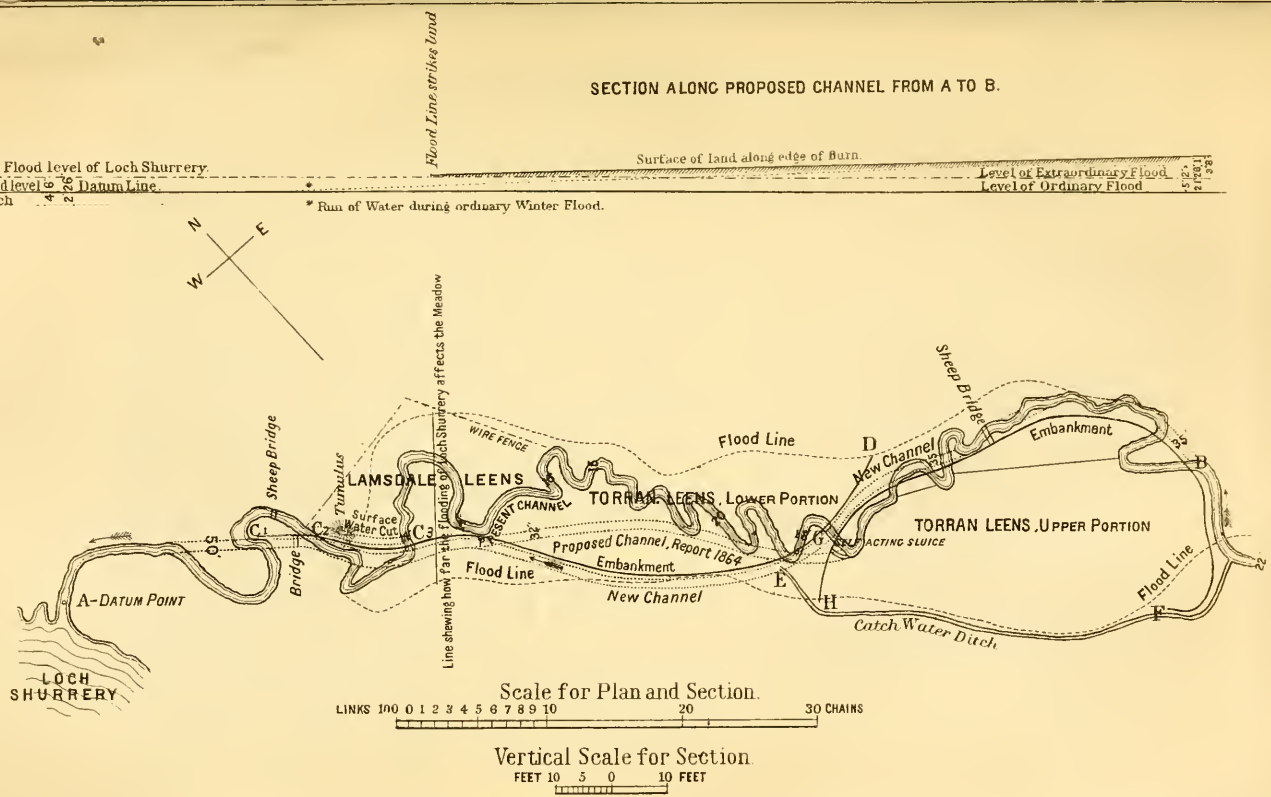
The works have answered the purpose for which they were intended perfectly, and "Torran leens" are thoroughly secured from flooding.

Cost of Works.

1865.			
Dec. 27.—To Geo. Sinclair, amount of first contract for new channel,	L.281	0	0
„ 27.—To Do., additional cost of do., fixed by Mr Smith,	32	12	0
„ 27.—To Do., cost of embankments, fixed by Mr Smith,	24	15	0
„ 28.—To Geo. M'Kay, account of woodwork of three bridges,	15	5	9
„ 28.—To Do., account of self-acting sluice,	5	11	10
May 29.—To W. R. Tait, account for survey and reports,	12	12	0
	L.371	17	1

1900 cubic yards of soil have been excavated and wheeled to the leens side of channel, sloped on the channel side, and faced up with turfs to a height of 4 feet, for the embankments. The whole excavations have been sown with grass seeds.

The whole leens are about 100 acres in extent—Torran leens



Mould & Tod, Lith., Edinburgh.

PLAN AND SECTION OF TORRAN BURN,

shewing proposed new Channel for Burn.

Trans. High. & Agr. Society, February 1869.

75 acres, and Lamsdale leen 25 acres, or thereby. The soil is a rich and free alluvial loam.

The upper portion of Torran leens, before it was secured, grew an immense quantity of rushes and some sedges. The lower portion grew a variety of benty and tufty grasses, amongst which *Phalaris arundinacea* and *Agrostis vulgaris* were conspicuous. The higher and drier parts of both the above grew luxuriant and succulent meadow grasses. Lamsdale leen, from being regularly mown, was as smooth as a lawn, and gave sweet and nutricious meadow hay when safely secured. The sedges have disappeared from the upper portion since the flooding has been prevented. The rushes look as if the decayed yellow growth of 1864 had not yet fallen from them, and seem from want of the former moisture incapable of growing green. The sheep during the long-continued snow storm of last year lay into the rough grasses of the lower portion, and, when the snow took off, the surface was as if it had been cut with a scythe. Suitable storm stells have since been erected for enabling the sheep to work the leens safely with snow.

The injury by flooding to the sheep stock has been already stated. Up to 1864 one-half of the ewes on the hirsel were Black-faced, and the other half Cheviots; since then the whole has been put under Cheviots. They came through the severity of last year without assistance, and produced a good crop of lambs. This winter, there have been one hundred more on the ground than when the half were Black-faced, and they are in good condition now. There has not been the slightest symptom of rot, or a pocked sheep in the hirsel since 1864.

Mr Andrew Hall, Sutherlandshire, one of the first authorities of the north in connection with sheep, inspected and reported on the capability of the farm for carrying a sheep stock, on account of the former tenant, about fourteen years ago. He told the reporter last summer that, in his opinion, the Torran side of the farm, before the leens were relieved from flooding, was only suitable for Highland cattle, and was not safe for them, but that he knew it would make a good ewe hirsel now. Mr George Glendinning, Hatton Mains, Ratho, inspected the improvement in September 1866. He thought it highly beneficial for the property, and that it would pay well. He also expressed his satisfaction with the engineering and execution of the works.

REPORT ON TREES NOT LIABLE TO BE DESTROYED BY RABBITS.

By C. Y. Michie, Forester, Cullen House, Cullen.

[*Premium—Five Sovereigns.*]

The destruction of forest trees, shrubs, and hedges, &c., is so great, and in most cases such an increasing evil, as to call serious attention to the subject. From the circumstance of so much land being under cultivation, summer food is thereby abundantly provided; but when harvest is over, and the turnip crops stored, or the fields occupied with shepherds, and their dogs and flocks, rabbits and hares have no retreat but the plantation, and hither they repair, both for safety and food, and the plantation suffers in consequence.

The destruction of forest trees, shrubs, and hedges is much greater than appears to the cursory observer; but it is a subject which those who can best speak upon seldom do, from reasons unnecessary to be explained. Which sorts of forest trees to plant, and how to plant them, so as to be most secure against the destruction of rabbits, is a twofold subject, well calculated to agitate and perplex the minds of all interested and reflective persons at the present day.

Finding that year after year the crop last planted had fallen a prey to rabbits, after a great amount of labour and expense had been bestowed upon it; and, generally speaking, the more labour bestowed and greater the expense, so in proportion was the destruction and consequent loss; it, therefore, occurred to the writer, as a matter of economy, that it would be well to lessen the expense, so that if plants could not be preserved, money might at least be saved; reasoning thus—If one plant out of ten escapes, for every hundred trees planted ten will be saved; and the smaller the plants the greater their safety. It also appeared that the larger (not exceeding 4 feet) the plants the greater the destruction and money loss upon each. Another self-evident circumstance was, that wherever the ground was newly dressed or in any way disturbed, as in trenching, paring, pitting, pulling off the heath, or cutting whins, broom, &c., all such operations rendered the ground more attractive to rabbits; hence almost every tree planted under such circumstances fell a ready prey, and were frequently destroyed within twenty-four hours of the time of planting.

Under the circumstances above detailed, a gentleman suggested to the writer the following plan, and which accomplishes all that was anticipated of it:—

First, To select small plants, 1-year seedlings 1-year bedded, at a cost of from one-third to one-half that of transplanted trees.

Second, To make a slit on the side or even in the centre of tufts of heath, grass, or other herbage, carefully put in the plant, covering the herbage all around, as if no derangement or disturbance had taken place, and thus secure the plant against the destruction of its enemies. The top only being exposed, which has little attraction at that age, being passed by on the first visit, is never again so liable to destruction, save during a protracted snow-storm, when it appears a few inches above the surface of the frozen snow.

The work of planting is best either to be done in the end of September and October, or delayed till April; the latter month is preferable. In spring, the winter's severity is over; and as soon as fresh shoots of grass appear, the rabbits are thereto attracted, and thereby the plants escape for at least one season. If possible, the planting of larch should be delayed till spring, at least if the ground is bare, as the plants, if at all conspicuous, are all but certain to be eaten the first or second night after planting. After the middle of May scarcely any further damage occurs (to evergreens at least) till a severe storm occurs the succeeding winter.

Rabbits, like all other animals, have a greater preference for some sorts of food than for others; and while some sorts they covet and seek after, others they dislike and shun. Upon this hypothesis the Highland and Agricultural Society have invited reports. Not only has the rabbit a preference for one description of food over another, but has a stronger affinity for one class of plants at one season of the year than at another. Whether it is that winter severity whets the appetite or imparts a certain flavour to the food, or both combined, is neither easily ascertained nor of much importance to the present subject to know. This much, however, is self-evident, that many plants are eaten in winter which are despised in summer, and many are devoured during winter frosts which are passed by in open fresh weather.

The following are the rates per acre at which the work of planting under a head of rabbits is efficiently executed:—

5000 1-year seedlings 1-year bedded Scots pine, at 4s. 6d. per 1000, ...	L.1	2	6
Two men and one boy planting the above, .	0	10	0
Carriage of plants and incidental expenses, .	0	2	6
	L.1	15	0

As already stated, pitting is incompatible with growing a crop of trees under a head of rabbits, and the same may be said of trenching; yet there is much ground where the breaking up of its surface is of primary importance. In order to secure the benefits resulting from pitting, and yet avoid breaking the turf,

or rendering the surface "red," as it is termed, and the consequent destruction from rabbits, an instrument termed the borebill, a peculiar sort of footpick, is used, which does its work most efficiently; is much in preference to pitting, and answers all the purposes of trenching (save extracting the roots of trees), and adds to the expense of an acre of 5000 plants about 20s.

Larch, spruce, and Scots pine, &c., are all planted in a similar way, and the only difference in cost consists in the difference of the price of the plants, which vary from 1s. to 2s. 6d. per 1000.

Compared with the above practice is the following old but common one:—Pitting at 4½ feet apart, and planting with 2-year seedlings 2-year transplanted Scots pines, cost from L.3 to L.4 per acre; while planting an acre as above recommended costs less than half, and at the same time secures a proper crop of trees.

Preparatory to planting moorland under a head of rabbits, the heather should be burnt, say three years before planting. By this means it is greatly sweetened, and the rabbits are equally fond of young heather as of pines; hence if the plants are not higher than the young heather, which they should not be when planted, they thereby escape injury for a time.

Hedge Plants.

Much difficulty is experienced in growing hedges from the disposition of rabbits to destroy the plants, and it is a matter of serious consideration in planting which sorts of plants to use, in order to avoid disappointment. After long experience, observation, and experiment, the following appears the order in which rabbits show their preference for the various plants of which hedges are usually composed. Beginning with those for which they appear to have the strongest liking, these are—

First, The crab-apple, when planted either in a hedge or as a single plant, is the first to be attacked and unbarked. Its young shoots and leaves are also much relished. The crab-apple is therefore a plant which should not be planted unprotected in the vicinity of rabbits.

Second, The common white thorn, of which our general hedges are composed, is very liable to be destroyed by them. The young shoots and leaves are preferred to the bark; but in winter, when a snow-storm prevails, the bark is readily peeled off and devoured. Owing to its extreme liability to have its young shoots eaten, it is not to be depended upon as a hedge in the neighbourhood of rabbits.

Third, The beech suffers much from them, and has the peculiar disadvantage, that when once eaten on the top, it is a long time before it fully recovers itself. The terminal bud of the beech is that from which emanates the only strong shoot; and if this bud

is destroyed, none of the others produce a shoot equally strong that season, nor frequently for several years to come.

Fourth, The black thorn or sloe is less liable to be eaten than any of the preceding sorts of hedge plants. Rabbits are at least less fond of its young shoots than of either the crab-apple or white thorn, neither are they so fond of its bark. The greatest injury it sustains is to its leaves; its bark, even in frost, suffers little.

Fifth, The hornbeam suffers most from the loss of its young shoots, especially the terminal ones, which, in the case of small plants, are certain of destruction in winter. Its leaves are less attractive than those of the beech or of the preceding sorts of plants. The hornbeam, like the beech, should be planted when about 3 feet high; and in planting it to form a hedge, it is well to mix it with privet, of each an equal number.

Sixth, The Siberian buckthorn is not liable to have either its leaves or its twigs eaten, or its bark peeled. The latter only occurs during severe storms of frost and snow. It is to be regretted that this plant is so little cultivated or employed as a hedge plant. It possesses several points of merit for the latter purpose.

Seventh, The holly is not liable to have its leaves or twigs eaten; but while its leaves and young shoots escape, it is far otherwise with its bark. The bark of the holly suffers much in severe frosts; even large trees of it are frequently barked by rabbits during snow-storms. In planting a holly hedge it is very advisable to mix it with privet; the latter forms a good protection to the former. In preserving single specimen plants of holly during winter, when so formed as with difficulty to be protected with other means, an application of blood, oil, or milk, mixed with soot, and applied to the lower parts, renders the bark distasteful for a while, but requires frequent renewal, as rain in a short time washes it off.

Eighth, The berberry is little liable to destruction from rabbits, either in its leaves, shoots, or bark. In summer its leaves are partially eaten, and in winter its bark is occasionally peeled off and eaten; but it is a plant which, under ordinary circumstances, is seldom much injured by rabbits.

Ninth, The common privet is very rarely injured by rabbits. In summer it may be seen in hedges of thorn and beech with its twigs and leaves perfect and entire, while the former species are bared of their leaves as high up as the rabbits can reach. In winter, too, when other surrounding plants have their twigs eaten and their wood much barked, the privet all but entirely escapes. After much experience of the privet, the writer can with confidence recommend it as all but safe against the attacks of rabbits.

Tenth, The elder, though as a hedge it is now seldom planted, yet on account of its entire exemption from the attacks of rabbits (and probably all other animals), it is on that account alone entitled to a more important place than it now occupies.

Eleventh, The box-tree, though not employed as a common hedge plant, is yet at times planted as a hedge for ornament, about the shrubbery and other places exposed to rabbits. For any such situation it is well adapted. The writer has never observed it injured by rabbits, though exposed to a large stock of them during severe snow-storms. The box-tree may therefore be planted under exposure to rabbits with perfect safety.

Twelfth, The butcher's broom, though not suitable as a hedge plant under ordinary circumstances, is yet at times made to occupy such a position, and, when placed on the top of a face wall or other eminence, it looks well, and has the important merit of being "distasteful to rabbits."

The preceding list embraces most plants grown as hedges, and a few others seldom so grown; but to that list might still be added some plants which might form hedges, and at the same time remain uninjured by rabbits. Such plants, however, will be enumerated under another head.

Another class of plants, equally important in their place (the shrubbery), deserves special notice; but those plants already named as hedge plants, though equally appropriate for the shrubbery, will not be again recognised.

First, The raspberry, which is very excellent cover for pheasants and other game, presents no appearance of being eaten.

Second, The bramble, which, while it resembles the rasp, like it is exempt from injury by rabbits, hence is entitled to certain situations in the woodland where pheasant cover is wanted

Third, Ivy being a favourite plant, and one which delights the eye both in summer and winter, is all but exempt from the attacks of rabbits. Its leaves they can scarcely be induced, even through hunger, to eat. Its young wood they refuse, and it is only the bare stem, as it clasps the trunk of the stately tree, and when the gnawings of hunger are very keen, that they bark it.

Fourth, Honeysuckle is a favourite plant with all admirers of nature. It renders fragrant the dell, the grove, and the garden, and is also much employed in trellis-work, both in the garden, the shrubbery, and in the policies. In the latter places it is much exposed to the injuries inflicted by rabbits, and it is very satisfactory to know that they seldom or never injure it.

Fifth, The spiræa is never injured to any extent. During severe weather the extremities of the side branches are slightly nipped, but it scarcely appears conclusive that any of it is actually eaten as food.

Sixth, The snowberry is a beautiful plant, especially in winter, with its wax-like balls richly hanging from the extremities of the spraying branches. The injuries which this plant receives from rabbits are so slight as to entitle it to a place amongst those acknowledged as rabbit-proof plants.

Seventh, The spurge laurel is a beautiful plant, not only on account of its flowers, but specially for its foliage. It deserves more extensive planting in all demesnes where rabbits, &c., are numerous. Like the elder, it appears as if no animal would eat or even touch it. Growing in the midst of a large head of rabbits, it is perfectly free from injury in all its parts, and may safely be planted where rabbits are numerous.

Eighth, The rhododendron is in point of safety equal to the spurge laurel; very seldom is a branch nipped off, and still more seldom is its bark injured or a leaf wholly or even partially eaten.

Ninth, The periwinkle, of which there are several varieties, all beautiful and much to be admired, appear almost entirely exempt from injuries by rabbits.

Tenth, The azaleas are almost entirely exempt from injuries, and it does not appear that there is any important difference as to the variety. I have scarcely ever seen a twig eaten off by them either in summer or in winter, and never saw any of the stems peeled or the bark in any way injured.

Unfortunately, the preceding list excludes many of our best and most admired shrubs, including the bay laurel, Portugal laurel, sweet bay, yews, &c. These, with many others, if planted without proper protection, might as well not be planted, as their destruction is inevitable.

The birch is not greatly liable to sustain injury from rabbits, except in the early part of summer, when they eat the leaves off the lower branches.

The willow is a plant which rabbits are in general fond of; they eat the shoots at all seasons, and seize upon the bark in winter.

The poplar comprises many varieties, and those I have found most liable to be eaten are as follows, and in the order given: —1*st*, The black poplar; 2*d*, The black Italian; and 3*d*, The aspen. Those of which the rabbits are least fond are also given in the order of dislike:—1*st*, The Abele poplar; 2*d*, The balsam poplar; and 3*d*, The Lombardy. Rabbits are by no means fond of any varieties of the poplar, but seem to prefer the black and have a strong aversion to the Abele, and indeed to all hoary-leaved plants.

The mountain ash suffers a little in the early part of the season by having its young shoots topped, and in severe winter weather the young trees are occasionally barked; but it is a tree which rabbits are by no means fond of, either leaf, branch, or bark.

The leaves of the common beech are fondly relished in the early part of the season, but as summer advances they are less coveted, and in autumn and winter remain untouched. The purple and copper-coloured varieties are less relished than the common sort.

The elm is much relished by rabbits, and they prefer the English to the Scotch variety. Its leaves, branches, and bark are all fondly relished, both during summer and in winter, so that it cannot be recommended as at all safe under rabbits.

The horse chestnut, in case of young plants, is occasionally peeled in winter, but older trees are not injured, neither are the leaves eaten; hence this tree may be safely grown amongst rabbits, if planted of considerable age and size. The sweet chestnut is liable to damage of the bark in winter, and to have its leaves eaten during summer, hence cannot be recommended to plant near rabbits unless protected.

The walnut is not liable to injury from rabbits; they neither eat its leaves in summer nor its bark in winter.

The sycamore may be considered the safest of all the common hard-wood trees to plant under a head of rabbits. During summer they seldom eat or injure the leaves or young wood, and as seldom peel the stems in winter. The sycamore has been esteemed by the writer for many years as decidedly the safest of the hard-wood class to plant under the above circumstances, and he therefore with confidence recommends it for that purpose.

The common ash is so well known as choice food of rabbits, that it needs no comment; and even the varieties embracing the weeper and entire-leaved ash are if anything still more preferred. Ash is quite unsuitable under rabbits.

Being unable to satisfy myself as to the preference which rabbits have for the different varieties of oak, I cut branches from them and stuck them into the ground during snow-storms, and found as the result that the Lucumbe oak was the first which had its twigs eaten and the branches barked; next in succession and degree was the Turkey oak, next the common oak, and lastly, the scarlet oak. This experiment was carried out with tame rabbits with similar results.

The alder is by many persons considered quite distasteful to rabbits, which unfortunately is a wrong impression. A gentleman near Inverness planted alder extensively two years ago, in good faith of its not being injured, but was disappointed at finding last spring, after the severe preceding winter, that nearly all the plants were peeled and destroyed. I planted a row of silver alder (*Alnus incana*) in a nursery row, between sweet chestnuts and oaks. A rabbit having inadvertently got into the nursery, ate the bark off some of the alders in preference to the other trees.

The writer having closely examined the work of barking and

eating deciduous trees and shrubs and some evergreens (not coniferæ), he concludes this part of the subject by drawing it within a narrow compass, and, by way of showing clearly what is truly practical, he will repeat the names of those plants which he believes may be planted with considerable safety under a full stock of rabbits :—1*st*, As hedge plants are the elder, the privet, and box; 2*d*, Shrubs—The spurge laurel, rhododendron, arborvitæ, butcher's broom, ivy, honeysuckle, and periwinkle; 3*d*, Ornamental trees—The evergreen, oak, and walnut; 4*th*, Forest trees —The sycamore, Abele, and aspen poplar.

Though the above may all be regarded as plants which rabbits will not eat or injure, yet, when severe and protracted storms occur, and rabbits are famishing for want, none of them are entirely safe, not even when of large size.

There are certain varieties of the same species of plants more liable to be eaten than others. We often observe a few plants *selected* for eating from amongst others; whence the preference we cannot tell. The way in which plants are made choice of for eating has given rise to division of opinion as to the species which they prefer, and it is only through wide and extensive observation that a just conclusion is arrived at.

Coniferæ.

Having given an account of deciduous trees, shrubs, and a few others, I shall next make a few statements upon the pine and fir class, beginning with the more common sorts and ending with the rarer coniferæ.

Scots Pine.—I have carefully and minutely examined the effects of rabbits upon this tree—1*st*, Because of the many opportunities of doing so; and, 2*d*, Because of its immense importance as a timber tree. There are two circumstances under which this tree is injuriously eaten—1*st*, When planted into ground where the surface is broken, or rendered bare of herbage; and, 2*d*, When planted amongst whins, broom, or rank heath, which is cleared away from the trees a few years subsequent to planting, thus exposing the stem, which never fails of being peeled.

Larch.—There is no way known to the writer in which larch can be grown with safety where rabbits are numerous. The most successful way is that recommended at page 447.

Norway Spruce.—This is a tree that may be grown with greater success under a large head of rabbits than either larch or Scots pine. It possesses the following advantages :—1*st*, It grows well on damp rough ground, which rabbits do not usually frequent, hence is less liable to be destroyed; and, 2*d*, Rabbits are by no means partial to eating or barking it.

The silver fir, though a noble and fast-growing tree after the first few years, is very liable to destruction from rabbits. They are

not so fond of the leaves as of the young branches and the bark. As a proof of their preference for the bark of silver fir over that of Norway spruce, in a plantation under care of the writer, composed of spruces and silver firs of about equal numbers, in the spring of 1867, the whole of the silver firs were found to be less or more peeled, while not one of the spruces were at all injured.

The *Pinus Laricio* is one of the few species of trees little liable to injury from rabbits. When it is grown amongst Scots pine and larch it quite escapes, while they are destroyed.

Pinus Smithiana is a tree as little injured by rabbits as any in the forest or pinetum. They do occasionally nip off the terminal shoots of the branches, but they do not consume them as food, nor peel the stems of the trees.

Pinus Menziesii is a tree that stands in the same list as the preceding one, and is exempt from the destruction of rabbits to much the same extent. I have seen it growing all but entirely untouched in the midst of a colony of rabbits.

Pinus alba (white American spruce) is very rarely eaten in any of its parts, leaves, branches, or bark, hence is very suitable for planting under hazardous circumstances.

Pinus nigra (black American spruce) is, in regard to safety, first in its class. Having seen the black American spruce growing in highest perfection, surrounded with others quite destroyed, leads to the conclusion that it is a tree all but entirely exempt from the injuries inflicted by rabbits, and may, therefore, be planted under a numerous head with perfect confidence of future safety.

The *Araucaria imbricata* is often spoken of as a rabbit-proof plant; this unfortunately is not the case. Rabbits do not eat its leaves; but as soon as they fall off the lower part of the stem, leaving it bare, it is readily seized upon and peeled.

The *Cupressus Lambertiana* is a tree almost quite safe to plant under rabbits; it is only during extreme snow-storms that it is injured, and that very slightly in the bark.

The *Cupressus Lawsoniana* is also a tree which rabbits dislike. None of it is injured under a full stock of rabbits; and when most other plants are eaten, I have no hesitation in classing the *C. Lawsoniana* amongst game-proof plants.

In order to test the tastes of rabbits for certain plants, the writer procured a number of tame ones, and kept them in a large loft, giving them nothing to eat for three months but branches of trees, shrubs, &c. He gave them from four to six different sorts at a time, and allowed them nothing else till a fresh supply was brought after two or three days. This mode of testing which plants they liked and which they disliked was very tedious, and, moreover, unpleasant to the feelings to see the creatures so lean

and hungry, almost preferring to die rather than eat certain of the plants given them. He found that the same species of plants which the wild rabbits preferred were also preferred by the tame ones, and the plants chosen or rejected by both were alike.

The following is a summary of all the observations and experiments made, showing their practical results :—

First, I find that amongst hard-woods, which suffer little by rabbits during frost and snow-storm, and may be regarded as safe, are the sycamore, scarlet oak, and evergreen oak.

Second, Coniferæ. I find almost no practical difference amongst the following sorts in point of liability to destruction. I give them in the order in which I find them least liable to be injured. 1*st,* The black American spruce ; 2*d,* The white American spruce ; 3*d,* The Norway spruce ; 4*th, Abies Smithiana ;* 5*th, Abies Menziesii ;* 6*th, Picea cephalonica ;* 7*th, Pinus Pinsapo ;* 8*th, Pinus Laricio* ; 9*th, Pinus ponderoso.*

Third, Hedge plants :—1*st,* The common privet ; 2*d,* The elder ; 3*d,* The box ; and, 4*th,* The hornbeam.

Fourth, Evergreen shrubs :—1*st,* Spurge laurel ; 2*d,* The rhododendron ; 3*d,* The butcher's broom ; 4*th,* The periwinkle ; and 5*th,* The ivy of sorts. To these may be added the spiræa, honeysuckle, and azalea.

Fifth, The arborvitæs (Chinese and American) are seldom nipped, and probably never eaten. The Irish juniper is also obnoxious to them ; and they rarely injure either the common juniper or the yew.

Remarks.

1. Either very large or very small plants should be planted amongst rabbits.

2. The ground should be prepared by means of the borebill, and not by trenching or pitting, which attract the rabbits.

3. Extensive groups, which cannot practically be protected with iron cages, should have their stems anointed during winter with blood, grease and soot, or soap, so as to prove offensive.

4. The leaves of all evergreens are either utterly despised or less relished than those of deciduous trees, &c.

5. There is no plant with which the writer is acquainted but rabbits will eat, when sufficiently hungry, even though they die from eating it, which they frequently do.

6. Save the white thorn, crab-apple, laburnum, and a few others, plants do not suffer during summer ; but as winter approaches, and before it sets in, all plants liable to destruction should be protected.

7. Districts much infested with rabbits should be planted closely together, and as large an area at one time as possible.

8. In spite of all efforts to prevent it, rabbits destroy a large area of plantation and shrubbery every year.

9. Policies can never be made to look so sweet and neat, and be kept at the same expense, with rabbits.

10. Specimen plants cannot easily be grown to such perfection (even with additional expense) when protected against rabbits.

11. The expense necessarily incurred in growing wood under a head of rabbits is such as to render the investment hazardous and often profitless.

12. Those trees and plants exempt from injuries of rabbits are too limited in number, too expensive to raise, and many of them of too little value, when grown to their highest perfection, to warrant reasonable hopes of satisfactory results from planting them.

REPORT ON TREES NOT LIABLE TO BE DESTROYED BY RABBITS.

By Robert Hutchison of Carlowrie.

[*Premium—Silver Medal.*]

In these days of outcry by the agricultural tenantry against the game laws, and their alleged pernicious administration and destructive effects in protecting hares and rabbits in many localities, to the deterioration and partial destruction of the field crops, it is well to be reminded that the ravages of such vermin are not confined, as farmers seem to imagine, to the acreage of the farm alone, but that they commit other depredations quite as troublesome and annoying, if not ultimately more serious, in nibbling the bark and young terminal points, and so destroying, year by year, the very existence of many millions of thriving, newly-planted young woodlands in recently formed plantations throughout the country. There is, probably, less ado made about such devastations, seeing the land so ravaged is not rented, but is generally in the natural occupation of the proprietor; yet when it is considered that the importance of all land now-a-days yielding some revenue is of considerable moment, the return from the acreage under woodland and plantations becomes valuable, and it is interesting as well as instructive to inquire how far, and by what means, the ravages of hares and rabbits upon our plantations can be controlled, or what sorts of pines and other useful timber trees may be safely planted, with hopes of ultimate commercial advantage and successful culture.

It is during winter that the most destructive attacks of such vermin are usually made, and they are then most severe upon newly planted or transplanted subjects. At this season, pressed to find subsistence, and with snow frequently covering any scant pasturage or herbage that may exist in their neighbourhood, it is

naturally most difficult to deter them from attacking almost anything, whether young hard-wood or fir, up to about ten or twelve years of age. They are especially destructive to many, if not all variegated foliaged evergreens, such, for example, as the Golden Hollies, Golden and Silver Yews, and Golden Thujas. These they will devour and entirely destroy. Amongst the dark-green foliaged coniferæ we find that they are very prone to attack the *Pinus austriaca*, and that even the green-clad young terminal buds of the common Scots fir, or the young tender shoots of the larch, do not escape their attention. We have frequently observed them at work upon the pendulous lateral lower shoots of *Cedrus Deodara* in the autumnal evening; but were the hares and rabbits to confine their attacks to it, in heavy soil they would do a material benefit, for no small amount of the success attending the growth and formation of a good leading shoot of the *Cedrus Deodara*, in the locality referred to, is owing to the admirable close side pruning or foreshortening of the plants by the nibbling of rabbits, thus directing a greater amount of growth into the upper tiers of branches and terminal leaders which happen to be beyond their reach. We have found them very severe upon young transplanted specimens of the English yew, say from 9 inches to 1 foot in height; and, without protection, we do not find it safe to plant or transplant out in open ground such specimens.

It is almost impossible to specify a list of trees, either hard-wood or coniferous, that will withstand the ravages of hares and rabbits in all situations. A few years ago, when the *Pinus Laricio* was first sent out by nurserymen, it was lauded as the only pine of any value as to timber that was adapted to resist the attacks of hares and rabbits. Since then, in many cases, public opinion has altered somewhat in its views in this respect regarding this conifer, and many people now assert that it does not possess the repellent nature originally ascribed to it. On this point we have pretty conclusive testimony, and have come to the deliberate conclusion, after several trials and reported experiments, that of all the hard-wooded conifers in general use, *the true variety* of *Pinus Laricio* is best calculated by its inherent properties to withstand the attacks of hares and rabbits. From several instances recorded in our notes on this point, we would here merely adduce the testimony of Lord Ducie, whose careful and exact observations on arboricultural subjects are well known, and who in 1865 planted at Tortworth Court (Gloucestershire) a *P. Laricio*, then about 6 inches in height, in the middle of a swarm of rabbit burrows. For the first winter it was untouched; then came the severe storm of the spring of 1866, when hard pressed, and with no natural supply of food near the spot, the rabbits "tried" in their dire extremity the

tips of the leaves of the lately planted Laricio, stumping back their points, but without at all damaging the health of the plant, which, notwithstanding, made a leading shoot that season of about 2 inches, quite as much as could be expected after being transplanted that year. In January 1867, Lord Ducie reports, that "although the leaves are somewhat cropped, the plant is substantially sound, and promises a strong growth this year." Lord Leicester has also demonstrated this innate repellent quality of the Laricio at Holkham; and Mr Gorrie there recommends it highly, unless in any locality where vermin swarm so thickly as to have difficulty in getting an ample food supply from natural sources near their burrows, and he considers it very likely to stand uninjured until almost every other tree has fallen a prey to their destructive attacks. In the extensive and varied pinetum of Durris (Aberdeenshire), Mr Gordon informs us that he is at a loss to know what description of young trees hares and rabbits will not eat when hard pressed for food, and starved during a snow-storm, and that, under such circumstances, the Laricio is *not* safe, although it is the last tree they seem to care to touch. In other localities we have been told that this valuable property alleged to be possessed by the Laricio is erroneous, and that in some quarters it is quite as much eaten as the *Pinus austriaca*, or any other pine; but this, we think, is a mistake, and has arisen from the fact, that some years ago, when the demands for plants of *Pinus Laricio* was very great, after the larch disease became so generally prevalent, many thousands of young plants were imported and sent out as Laricio, which were not the true variety, but of a description more allied to the *Pinus pyrenaica;* for we have not yet found, after trial, that the true *Pinus Laricio* is at all palatable either to hares or rabbits.

Unless very hard pressed for food, we have found that the common spruce, about one foot in height, resists their attacks very well, and is one of the very safest pines to plant where hares and rabbits abound; and we know instances where parts of a plantation have been got up by use of this tree, when the forester had been baffled with everything else.

Among the lists of newer coniferæ, whose flavour and fibre seem most distasteful to these vermin, we may name the *Sequoia sempervirens, Wellingtonia gigantea, Cedrus atlantica, Thuja gigantea,* and *Thujopsis borealis,* and, indeed, many of the Picea family, the Juniperus tribe, and many of the Cupressus. They seem to resort more to the Pinus species, and eat out the young buds from the lateral branches within their reach. Of the young tender buds of the *Pinus Pinsapo,* and especially of its terminal shoots, they are particularly fond; and as an instance of their partiality for the larch, we may remark that in January 1867, at Harewood, near Leeds, ten acres of cover were planted with a

mixture of larch, privet, sloe-thorn, and hazel, about four feet apart, and that by the end of February not more than one or two plants of larch in every ten planted had escaped. Amongst hard-wood trees, the species we find least interfered with is the sycamore; they will, however, attack the bark of newly planted trees of beech, ash, chestnut, oak, and common laurel. They are very fond of the bark of young laburnums; and it may not be mistaken policy to plant pretty thickly amongst young plantations shoots of that, and other small wood of comparatively little value, of which they are fond, so as to induce them to confine their attention to them, and thus save the more valuable hard-wooded trees and conifers.

For cover, we find that the *Rhododendron ponticum*, *Mahonia Aquifolium*, *Berberis Darwinii*, and large plants of the common garden boxwood, grouped in thickets, are most serviceable to game, and are untouched by hares or rabbits. Indeed, they will rather starve than touch the *Rhododendron ponticum;* while the Mahonia affords not only shelter and cover, but also fruit as food for winged game.

But while it is difficult to find a selection of trees that are certain to resist the ravages of these "*feræ naturæ*," and as it is inexpedient to limit ourselves to plant merely such varieties as hares or rabbits would not touch, there are precautions which may be adopted, and which serve the purpose well, of preventing the attacks of vermin from becoming serious, if, indeed, they are not thereby effectually prevented.

One of the simplest of these contrivances is, as soon as any plantation is fit to be thinned, to commence doing so in the beginning of winter, and to cut gradually through that season such young trees or branches as are destined to come out. The thinnings and prunings are left lying, and so long as there is a scrap of bark on these, the hares and rabbits will not touch the standards. Where the quantity to be cut out is small, it is even worth while to turn the thinnings; and if any young plantation is not far from those which are old enough to be thinned, it may not be too expensive and unprofitable an operation to cart or carry the thinnings, and lay them round the edges and outskirts of the young plantation. The propensity to attack newly transplanted trees or shrubs of almost any description is very great; and even if these be of large size, they will nibble and injure them severely. In such cases, it is a good practice to protect valuable specimen trees or rare varieties with a straw band, or rope of cocoa-nut fibre (a material cheaper than straw in the long run, and which is now sometimes used in stack-yards in lieu of straw ropes), closely twisted round the stems to a height of about two feet from the ground, and which will last for several years, by which time the bark of the protected plant is safe.

Another method sometimes employed for warding off the attacks of vermin from newly formed plantations is very easily applied, and is very efficacious. It consists in applying the well-known fact that these animals are easily kept off by the presence of anything distasteful to them. A mixture of the common Baltic (or Archangel) tar, with the requisite quantity of the cheapest anti-friction grease, well boiled together in equal parts, is prepared; and after planting any young wood, the boys who are usually employed in assisting at the planting operations are each furnished with a pot-full of this mixture, which they carry in the left hand, and dipping the right into the composition, they gently and quickly draw it from the neck of the newly planted tree at the ground surface up the stem to beyond the risk of damage from hares and rabbits. This simple and effectual remedy takes very short time, and one stout boy will soon go over a whole plantation. This coating, which, of course, does not require to be applied too thickly, has not been found to be pernicious to the trees in the smallest degree, and is indeed far superior to, and is more capable of being quickly applied than another composition frequently used, namely, coal tar mixed with cow dung and soil, and applied to the bark with a brush. This last named mixture we do not consider beneficial to the young newly transplanted trees, and the bark of some species may be injured by its injudicious use.

A writer in the "American Agriculturist," Jan. 1867, mentions blood as a specific, and recommends a slight sprinkling on the ground amongst the young plantations as quite efficacious; but of this remedy we cannot speak from experience, and should certainly prefer the composition of Archangel tar and grease.

In noticing some of the varieties of coniferæ which resist the attacks of hares and rabbits, we omitted to mention that many of those possessing the cork or spongy description of bark resist best, whether it be that the bark of such sorts is like the common cork wood, and will swell in the stomach if eaten or nibbled, or whether they are merely unpalatable, we do not pretend to know; but this is certain, that such trees are less liable to injury than the smooth-skinned species are.

Few proprietors can form the least estimate of the damage done to their woods and strips from the ravages of hares and rabbits alone; hence it is that we frequently find that the result of fifty or even a hundred years' growth of timber produces but a stinted crop, only because the trees have sprung from plants or stools unhealthy, and which have been stunted in their growth from this cause from the very commencement.

REPORT ON THE TRANSIT OF STOCK.

By George Menzies, Trentham, Stoke-upon-Trent.

[*Premium—Ten Sovereigns.*]

The transit of stock, in its effects on the animals, is a subject which hitherto has scarcely received that amount of attention its importance demands. Until within a comparatively recent period, the modes of transit were simple, and the attendant evils were proportionally of less consequence. In modern times, however, conveyances for stock have been multiplied, and while these have conferred incalculable benefits in many ways, they are yet attended by evils of their own which have been too much overlooked. Thus the mere fact that stock could be sent from Belfast to Glasgow in eight hours, or from Aberdeen to London in eighteen hours, seems to have so far satisfied owners of stock, that they have practically ignored the evils of the systems by which these results could be obtained, and have thought little about, not only the discomforts and miseries the animals endure—in other words, the diminution of their value—but also of the more serious and lasting injuries, in the diseases that are thereby produced and propagated.

In considering this subject, it seems desirable to divide it into three heads, viz., Transit by Road, by Sea, and by Railway, adding a few observations on the subject of disease, in reference to transit, after the various systems of conveyance have been noticed. And before entering on details, it may be well to mention here, in reference to legislation bearing on the subject, that previous to the appearance of the cattle plague in 1865, traffic in stock in this country was practically free of restriction so far as the Statute Book was concerned. There certainly existed the Act 11 and 12 Vict., cap. 107, but it was little known, and less used, and until the dire ravages of the cattle plague called forth energetic legislative action, it might almost be said that there were no laws for the regulation of traffic in stock, and owners could move animals about, in health or disease, very much as they pleased. Now, however, the powers of the Privy Council have been renewed and enlarged, and constitute an authority for the provision and application of regulations in stock traffic, according to the exigencies of circumstances. At the present moment, the foreign trade in stock is kept under control, while in the home trade restrictions have been almost entirely removed.

We now proceed to notice the various modes of transit, and first—

Transit by Road.—The conveyance of the various descriptions

of stock by road—in other words, making the animals convey themselves by the use of their own feet—may be termed the natural mode of transit, if its antiquity, simplicity, and the small amount of artificial help required be considered. The animals themselves do all the labour, man only giving intelligent guidance to their movements. To describe minutely anything so well known, seems unnecessary, and a brief outline of its general features will probably be sufficient for the purposes of this inquiry.

Horses are usually conveyed singly or in pairs, threes and even fours, and are walked along at the rate of about 3 miles per hour; they are seldom sent more than 25 to 30 miles (about one day's journey), greater distances being usually done by rail. Horses are usually baited once in every five hours, or for about each 15 miles of the journey. The only descriptions of the horse tribe which present any difficulty in transit are unbroken colts down to foals, unaccustomed to any kind of control, and full of the buoyant, playful spirit of early youth, they exhibit as much objection to being either led or driven as any obstinate member of the porcine race, and it certainly is a very awkward business to get them quietly along a road. The method usually adopted is to lead along with them the dam, or any horse with which they are acquainted, when they readily follow. Where this, however, cannot be done, there is nothing for it but to put on a halter, and administer the first lesson in "breaking." Ponies of all ages are frequently conveyed in droves, and generally walk along as quietly and circumspectly as so many sheep. These are often walked hundreds of miles, and are treated very much as mountain sheep, being walked slowly along by day, rested by night, and expected to pick up most of their living by the way; and a very poor living it generally is, as is witnessed by the poor condition and spiritless appearance they have when they reach the south country markets. Nevertheless, they do not appear to be permanently injured by this treatment, natural hardihood (being natives generally of high and bleak districts) apparently enabling them to bear great privations with comparatively little harm.

The horse is pecuniarily so valuable, and besides occupies so high a place in our affections, that his wants are seldom overlooked or forgotten, while he bears walking so well, that for moderate distances there seem few disadvantages, and scarcely any evils attending this mode of transit. Of the latter, the greatest is the chance of contact with diseased animals; but as the consideration of this falls in with the general question of disease in reference to transit, it is deferred in this and throughout the sections describing the modes of conveyance. It therefore seems only necessary to add here one suggestion, which, as it will certainly enable the horse to bear better the fatigues of

travelling, may be admissible, and although it has many times been pressed on the attention of farmers, it has received less attention than it merits, viz., a thorough good grooming at the journey's end, and by the way, if the journey be long. It is scarcely possible to overestimate the benefits of this to the travel-tired horse, whether he be about to appear in a market or merely resting by the way. No greater argument in favour of this is needed than a simple comparison of the animal's appearance before and after the operation; but it must be done in earnest, and not the mere "wisp down" which farm servants usually give.

Cattle.—The bovine race in all its stages, from the calf to the old cow, is so patient of control, and so easily driven in any required direction, that from 20 to 30 animals may easily be managed on the road by one man.

Store cattle of all ages are frequently walked very considerable distances—two or three days' journey is not uncommon, and West Highland cattle are often weeks by the way. Amongst the heavier breeds of cattle, however, which do not bear travelling like these mountaineers, 50 miles may be taken as nearly the limit of distance that cattle are now sent by road. They are usually driven at the rate of about 2 miles per hour, and will get over from 20 to 25 miles per day. They are almost never supplied with food during the journey, and seldom rested, being kept constantly moving slowly on, drinking as they like of such waters as they meet with, and picking up what they can from the roadsides, until they reach the end of the stage, and are turned into a field to graze, or to be supplied with hay, straw, turnips, &c., according to the season of the year. Sometimes a field cannot be got, or is dispensed with, and a common or a quiet lane is taken advantage of.

Fat cattle, especially those that have been fed in confinement when first started on the road, are rather frisky, and require a good deal of care to prevent damage to themselves or to fences, for which at first they seem to have a supreme contempt, but after the first two or three miles they sober down to a very quiet pace, and give little more trouble. As may be supposed, fat cattle do not bear the fatigues of travelling well, and therefore they are seldom walked more than 15 or 20 miles. Their supplies of food are regulated according to their destination. If going direct to the shambles, they are usually sent fasting; if going to market, the object being to make them appear to the utmost advantage, they are fed accordingly.

It may be well to notice, in passing, the difficulty generally experienced in moving single animals of this class. Attachment to their quarters and to their companions, added to the excitement animals usually display when first liberated from

confinement, or taken from amongst others, renders their conveyance singly very difficult. The method commonly adopted is to secure the animal's head to one of its fore feet with a rope so closely as to impede any action beyond a limping walk. Sometimes the animal's nose is secured with twiers, and if a double rope be used, one man going before the beast, and another following it, the transit is generally both quickly and comfortably effected. For bulls, this latter method seems the only safe one, and it ought always to be used. For ordinary fat stock, the former being simpler, as requiring only one man, may be preferred; but certainly it is much better to inflict complete restraint than to grant a liberty, which nearly always leads to the overheating of the animal at the best, and in many cases to downright fury, causing both danger and loss.

The chief evils which attend the transit of fat cattle by road are overheating and over-fatigue, the former frequently inducing a state of body which, after the animal is slaughtered, shows itself in the peculiar flabbiness—want of firmness—of the meat; while heavy animals often break down from sheer fatigue before they can reach the market or shambles, and are of so much less value in consequence. For these evils the remedy seems to be to drive them not faster than one mile per hour, to prepare house-fed cattle by a little daily exercise for a week or so previous to their journey, never to walk them distances over 10 miles if possible, and to give a little food and water once in five hours when on the way. For store stock the evils of the road are not very great, unless in extreme cases. So long as good quarters for the night can be obtained, they will go on from day to day with little detriment for many days together; but if they are compelled to subsist on what they can gather from a roadside or a bare field, and, still more, if no shelter be provided during inclement weather, the natural result is, that the animals rapidly lose condition, their coats stare, and they take cold, which, it is to be feared, is often the parent of many subsequent ills. The remedy, of course is very simple—proper food and shelter, and no over-driving. With these, and for moderate distances, there are not many objections to this mode of transit, and the time can scarcely be anticipated when it will cease to be the chief means of local traffic.

Sheep.—The transit of sheep by road presents very few points for remark. They are easily managed. A man, usually assisted by a dog, which is, for this purpose, worth a couple of men, will drive a flock of 200 or 300, and even sometimes as many as 500. They walk slowly—not much over one mile an hour—and fifteen miles will be a fair day's journey. Like store cattle, they are generally only rested and fed during the night, and water is generally found in abundance by the way if required, which, however, is but seldom. The distances which sheep are sent by

road are frequently very considerable. From Sutherland to Yorkshire was not uncommon before the opening of the railways, and now even Highland sheep, to the south, or to and from the wintering grounds, walk hundreds of miles. Like mountaineers generally, they stand the fatigue with little injury. The scantiest picking seems to support them in the many days of a long march, and they arrive in the south with but few traces of the long way they have come.

Leicester sheep do not bear travelling well. Their great weights, heavy fleeces, and comparatively tender constitutions, soon make them show signs of weariness; yet crosses, and indeed most descriptions of sheep, bear travelling very well; and if only good quarters could be obtained nightly, they might be walked with advantage distances which are now generally done by rail. But in an enclosed and cultivated country this accommodation is difficult to get, so that two days' journey may be looked on as about the limit for sheep in the ordinary traffic of the Lowlands. Unless the difficulty of getting sheep properly fed during their journey, there does not seem to be many objections to the ordinary mode of conveying them by road.

Fat sheep, like fat cattle, should be walked as short distances as possible. The least possible fatigue, with attention to food and rest, if the distance be over five miles, is perhaps the best treatment for them.

Pigs.—The conveyance of pigs by road is a very limited matter. Occasionally a herd of them is to be met, and generally under the care of an individual of Hibernian accent, who by some peculiar means contrives to get them along in a tolerably steady and satisfactory manner. Sometimes they are to be seen in lots of three or four on the way to the shambles, or if in store condition they are marched on foot by cottiers and small farmers to or from market, distances seldom exceeding two or three miles. Frequently they are carried in carts, and this seems on the whole the best means of getting them over the road, as by nature they are bad travellers, walking very slowly, soon becoming fatigued and footsore, and withal generally determined to go the wrong way. It may, therefore, be considered fortunate that the majority of pigs are either slaughtered where they are bred, or are moved when small enough to get into a "poke," which indeed seems to have been the natural conveyance for a juvenile pig from time immemorial.

Before closing the subject of transit by road, it may be worth while to notice one of its adjuncts, viz., the ferry-boat, with or without steam. Usually these are mere floating pens, into which the stock may be put and conveyed both with comfort and safety, if only properly used; but whenever the number of stock to be ferried becomes larger than the boat can comfortably carry, the common practice is to force into it as many as possible; and

again and again I have seen animals squeezed over the side of the pier into the water, in attempts to drive a greater number in than the boat would hold. The ferry-boat now plays a very subordinate part to what it once did; but still the practice of overcrowding both sheep and cattle in it ought to be repressed.

Transit by Sea.—In the northern and western islands stock are carried over sea in small sailing vessels, generally only half-decked; but as these approach more to the ferry-boat in character and use than to the sea-going vessel, it appears unnecessary to notice them further; and the following remarks will be confined to the consideration of the conveyance of stock in the modern vehicle of rapid sea traffic—the steamer—sailing vessels being now very rarely used for the conveyance of stock.

It can scarcely be said that any steamers are built for the purpose of carrying stock only, and this probably accounts for the very indifferent accommodation provided for stock in most of them, viz., that the vessels have to be applied to two purposes, which require different kinds of accommodation, and are accordingly built in the simplest form, leaving the erection of fittings which would facilitate the conveyance of stock to be put up in a temporary manner as occasion requires, and for the reason apparently, that the erection of these fittings in a permanent form would render the vessel comparatively useless for the conveyance of other kinds of cargo, hence all that is done is to fix rings around the bulwarks and sides of the holds, to which the animals can be secured, when stock forms the cargo.

Perhaps it may help the consideration of the subject to describe first the usual quarters into which stock are stowed on board steamer. On deck, the shape and appearance of which every one knows, there are usually two or more pens enclosed with strong paling, and the spaces around the bulwarks, from the quarter-deck to the forecastle, devoted to stock. The holds, which are not quite so well known, may be described as large dark apartments, varying in size, according to the size of vessel. Generally they are from 50 to 80 feet long, 25 to 35 feet wide, and from 7 to 9 feet high. All the light in them is supplied by the hatchway, so that in the lower hold at least darkness only is visible, and even in the upper one there is only twilight. Ventilation, properly so called, there is none, the hatchway being the chief vehicle of air as well as light. When the weather admits of it, the ordinary ventilating effect of the open hatchway is increased by stretching a sheet of canvas from the lowest point at which fresh air is wanted, to a point about 10 feet above the deck, and at such an inclination that the part of the sheet above the deck forms an angle of 45° with a line

parallel to the direction in which the wind is blowing. A current of air is thus intercepted, and carried down by the sheet, which greatly helps ventilation. Sometimes, also, one or two air-pipes are introduced; but any I have yet seen are altogether inadequate for thorough ventilation of a hold, into which perhaps fifty head of cattle may be packed. Such is a short description of the ordinary stock-conveying steamer; but it would be quite incomplete without some notice of a very important and grim-looking functionary, "the cattleman." Dressed in what originally had been coarse blue flannel, but now begrimed with sweat and dirt, until his dress and face and hands are the colour of soot, with matted hair and a fortnight's beard, and utterly unconcerned about the comfort of the animals under his care, he moves about his own peculiar domain, the hold, with the most absolute power, knocking the animals about, beating and cursing them in the most unlimited manner—evidently his leading principle being to resent as the greatest insult any resistance on the part of the animals to his manner of handling and securing them, and to visit them with condign punishment accordingly. So much for the cattleman. But to return to the subject of shipping stock, and to begin with

Horses.—These are usually put in "boxes," made just large enough to contain one animal. They are made movable, so that if the horse cannot be walked on board, the box is landed, the animal placed in it, and then hoisted on board by the crane. Horses are kept on deck or in the hold, according to the weather anticipated, being kept on deck in the generality of cases, and only sent below when very stormy weather is threatened. Valuable horses usually have a groom to attend them, but ordinary animals are left to the care of the cattleman, and sometimes have, and sometimes have not, provender sent with them. They are supplied with water generally three times a-day, so that, on the whole, the better classes of horses are here, as on the road, pretty well cared for. The chief evil to which they are exposed is the risk of catarrh, from the draughtiness of their boxes. This appears capable of being greatly mitigated. Boxes which have only open rails for the upper part ought to be condemned altogether, and the whole box, sides, ends, and roof close boarded, with a window for light, and a louvre ventilator in the end under the animal's head, and another in the roof over it, the louvre boards of both of which being movable, ventilation could be regulated according to the weather, and the animal supplied with fresh air in abundance, without being chilled in a draught. If these boxes were properly constructed, and food and water were supplied to the animals in a systematic manner (to prevent which there is absolutely nothing), there would not remain many disadvantages in this

mode of transit for the horse, except those which are inseparable from sea-travelling—viz., the dangers of stormy weather.

Besides the horses that are carried in boxes, another class of them, less valuable, are simply tied to the rings in the bulwarks, as cattle are, while the smaller descriptions of ponies are usually placed twenty or thirty together in a pen. Both these classes are treated so much after the manner of cattle, that the account of the latter may almost include them, with this difference, that an attempt is generally made by the cattleman to give all of them a little water occasionally; and to those that have a long voyage—say from Shetland to Leith—a little hay provided by the shipper. The usual manner of doing this is very unsatisfactory. The cattleman takes an armful of hay into a pen containing perhaps twenty ponies, and scatters it amongst them as fairly as he can. There are no racks or anything to keep it out of the mire, and consequently more than one-half of the scanty supply is trodden under foot by the ponies in their haste to get as much of it as possible. The horses tied to the bulwarks are little better off: a handful of hay is placed under the head of the animal, and very often before the beast can take a second mouthful the wind has blown it away. For both of these classes, in the matter of food, the nets described for cattle and sheep are recommended as being the simplest and best remedy.

Cattle.—These are each provided with a short halter ere they are brought alongside of the steamer. They are sometimes walked on board, but generally they are hoisted by a crane. This is effected by means of a sling, which is simply a broad sheet of canvas; this is passed under the belly of the animal, and reaches up its sides to within 12 inches of the backbone; its ends, which are finished with wooden bars to keep the sheet out to its width, are furnished with eye-holes to receive the hooks of the crane chain. The animal is thus lifted by its middle without injury, and the process both of putting on and taking off the sling is very rapidly done, while accidents from the beast slipping out of the sling are very rare, although I remember once seeing an ox fall out of one into the sea. The sling being fixed, the animal is swung on board, and lowered to the deck or to the hold, as the case may be. As soon as its feet touch the floor, its halter is seized by the cattleman, while one assistant unhooks the sling, and another seizes it by the tail, and, before the beast can recover from the surprise of its aerial trip, or attempt any overt movement, it is dragged, pushed, and beaten into its intended position, its halter passed through the ring, and its head pulled up to the side of the vessel almost as close as it will go, from 6 to 9 inches being the usual limit of rope allowed. Struggles are thus unavailing, and are quite unheeded, the process being repeated until the hold is full.

The animals are first arranged in two rows, with their heads to the sides of the vessel, and are packed as close as they can stand. When these are filled up, a third row is placed in the space between them by means of temporary fittings, leaving only narrow passages between the rows. The number of beasts that may be packed into a hold is limited more by the size of them than any other consideration, the practice invariably followed being, to fill up every inch of space possible.

Cattle for deck passage are treated similarly. They are usually arranged around the sides of the ship, with their heads secured to the bulwarks, and as close together as they can stand. These are also further secured by having broad planks fixed in temporary standards run along behind their buttocks, while a similar plank is fixed as a division to every tenth beast or so. The effect of this arrangement, when the animals are not actually jammed between the planks, as they sometimes are, is very good, especially during rough weather, steadying and supporting the animals during the rolling of the vessel. Systematic arrangements for supplying the animals with food and water on the voyage there are none. Shippers do occasionally send hay for their beasts; but if they do not, the steamer provides none; and even when the owner does, the position and method of securing the beasts in the vessel almost prevents the possibility of their either eating or drinking. What the cattleman does, when he has received hay for any particular lot of cattle, is simply to throw a little of it along the heads of these animals, and they certainly may get a little, but the bulk of it is dragged down amongst their feet in their attempts to reach it; and once down, it is irrecoverable. And so with water. Look at a row of twenty or thirty cattle standing as close together as they can be put, with their heads tied hard and fast to the side of the ship, and say how water is to be got within reach of their mouths, unless with greater labour than can be undertaken on ordinary voyages. When delay in transit occurs, and necessity compels the supply of food and water, the vessel is usually taken into a port, supplies got, and given to the animals; but these are special cases, and scarcely apply to general traffic, in which, as a rule, the beasts get nothing at all.

Sheep are treated on board ship very much as the cattle are. They are generally walked on board by means of gangways, are placed in pens, and carried on deck as much as possible, as they are found to stand the exposure on deck better than the close atmosphere of the hold.

The transit of sheep by sea calls for little further special remark, except as to its disadvantages and evils; and as cattle, as well as the inferior classes of horses and ponies, suffer similar evils, these, to avoid repetition, may be considered together.

The evils which afflict these various classes of stock during transit by sea are manifold. To begin with the deck, the first serious evil that presents itself is the almost total want of shelter. During two or three months in summer, when the weather is warm and fine, the want of this may not be much felt; but let any one observe the appearance of animals as they are taken into the vessel, and watch the progress of the effects of exposure (intensified undoubtedly by the want of food and water); see how they first begin to look cold, and their coats stare; gradually their backs begin to arch, and continue to rise, while their bellies are tucked up until their natural shape is almost lost; their feet and legs become numbed, and, after two days of it perhaps, a more complete picture of misery it would be difficult to find; while the discharge of mucous from the nose tells of mischief within, which may, and often does, lead to fatal consequences. Be it remembered that these animals are exposed to all kinds of weather, wind and rain, frost and snow, and, what is often worse than all, the lash of the spray in stormy weather. I have stood on the bridge of a steamer and watched how, even in a small storm, each wave as it was met sent a shower of spray over the vessel from stem to stern, and with a force which only those who have experienced it can fully appreciate; and the condition of the stock exposed to it was pitiable indeed. This state of things may not occur in every voyage, but it does occur sufficiently often to call for the application of everything that can be done to increase shelter; and the following suggestions would perhaps help somewhat towards so desirable an end:—

1*st*, Let the pens have light corrugated iron (galvanised) roofs thrown over them, slightly arched in the middle. The standards at present used for the boarding would be quite sufficient to carry them, if made of a suitable height, and a toprail added to receive it. 2*d*, In windy or cold weather, it is essential to protect the animals from the sweep of the blast, and this might readily be done by tying a tarpaulin along the side of the pen exposed to the wind.

Along the bulwarks a light roof, as suggested for the pens, might be erected by increasing the height of the standards into which the planks already alluded to are fixed, keeping the inside higher considerably than the toprail of the bulwarks, to allow water to run off. Then, instead of a division plank, a light close-boarded partition might be inserted. These would break the force of the wind to the animals, and also keep them tolerably dry, and thereby greatly increase their comfort; and as they might be constructed to be readily erected and taken down, there does not appear to be any very serious objection to their use.

In the hold, the first, and perhaps the greatest, evil to the stock is exactly the reverse of what occurs on deck; fresh air is

the great desideratum. The want of ventilation in the hold, and consequent foul air, heat, and stench, produce results more disastrous than even the exposure of the deck, rapidly producing low typhoid fever, which it is to be feared more frequently ends in pleuro-pneumonia than is generally supposed.

The condition of a hold filled with cattle or sheep, a few hours after they have been put in, must be actually examined to be fully appreciated; and the visitor must not be content with going merely down to the foot of the ladder, or even taking two or three steps towards the interior of the hold, as the stifling sensation experienced naturally suggests, but let him grope his way to the back corners, where nothing can be seen, but where the ventilation is worst, and where the quick breathing and constant moaning of the unhappy beasts only too truly indicate their sufferings, and we believe he will turn away sick at heart, and astonished that the animals can endure it. Then when a storm comes, and the hatches have occasionally to be closed for however short a time, these evils are a thousandfold intensified.

The hatchway, and the sheet for increasing its ventilating power, have already been noticed; and, while these must be used to their utmost capacity, some other arrangement must be devised to bring these holds up to even a moderate state of ventilation, the absolute necessity of which is now recognised on all hands. The following method is suggested:—Holds sufficiently raised above the water-line to be fitted with windows similar to those used in ordinary passenger cabins. These might be made sufficiently numerous to thoroughly ventilate a hold, with the help of one or two openings through the deck, for the escape of foul air. Such an arrangement, in smooth water, would be very effectual; but, of course, the windows could only be used in comparatively smooth water, and therefore some arrangement to effect ventilation in all weathers, in these upper holds as well as in the holds which are below the water-line, must also be found; and for this purpose there appears nothing so good as the multiplication of air-pipes, similar to those now used to ventilate the engine-room of a steamer. These pipes are about 12 inches in diameter, are raised about 10 feet high from the deck, and have bell-shaped mouths, which are curved forward so as to face the direction in which the vessel is sailing, thus meeting the current caused by its passage through the air, intercepting it, and conveying it downwards. A row of these might be placed along the sides of the vessel, a sufficient number of which could he carried down to the lower holds by means of light wooden, movable tubes, or gutta-percha ones, which, when not in use, would occupy very little space; then, along the centre line of the hold, another row of similar pipes would be required to carry off the foul air; these would be in shape precisely the same as the

others, but the bell-shaped mouth would be curved in the reverse direction, so that the action of the external air on them would be to quicken the discharge of air from them. Movable connecting tubes might be used to carry the foul air from the lower holds through the upper ones, without any risk of increasing the contamination of the air in the latter. The effect of this arrangement would be, that a current of pure air would enter at the sides, and as the temperature of the air in the hold would nearly always be higher than that of the external air, this current would naturally sink to the lowest parts, and would pass from the sides towards the centre, from which it would be discharged by the foul-air pipes. Thus circulation would be established, and all that would remain to be ascertained would be the capacity of the tubes required for a given number of cattle or sheep, to effect thorough ventilation. This latter question would soon be settled by practical experience; but, in the meantime, we suggest one down-pipe of 12 inches in diameter, and one up-pipe of similar capacity, for every 5 cattle or 15 sheep; and we further suggest that the mouths of both sets of pipes be made movable, so that they can be faced to, or from, the direction in which the current of external air is moving most strongly. By this means, and with ample capacity of tubes, the ventilation of the holds could at all times be completely regulated.

The next evils to be noticed affect both the stock on deck and in the hold—viz., the want of food and water. For stock that are only to be on board the steamer for not more than eight or ten hours, the want of food is not of very much consequence, unless accompanied with severe exposure to cold or wet, and therefore the following remarks are intended to apply rather to stock which are to be a longer time on shipboard:—water, however, we are inclined to insist on for all stock on board a steamer at least once in every six hours. The consideration of how these are best to be supplied brings up again what has been already alluded to—the usual method of securing the animals, cattle and horses, by tying their heads as closely as possible to a ring in the side of the vessel, and by placing them so closely together that access to their heads is almost impossible. If such is to continue to be the arrangement of these animals on board a steamer, the supply of the necessaries of life to them will continue, as it hitherto has done, practically impossible; but we believe the absolute necessity of supplying these will compel a change of arrangement, and therefore, as a preliminary to the main question, we suggest a method of effecting this. For the cattle on deck, let the standards and planks now placed along the buttocks of the animals be made a little stronger and more securely fixed than they are at present, and the animal's position may be reversed, and its head tied to a ring in the plank, instead

of to one in the bulwarks. For the cattle in the hold a similar erection might be used—such, indeed, as is at present used—to accommodate more animals than can be tied to the sides of the vessel. This arrangement would bring every animal's head within the most convenient reach of the cattleman that is possible, so that both food and water could be supplied with ease.

As to the kind of food to be supplied, there may be differences of opinion, but for general stock nothing appears to be better than hay, the natural food (dried) of horses, cattle, and sheep, and which, to the recommendations of being cheap and easily obtained in most places, adds this property, that its nature fits it for being supplied to the animals by an extremely simple means, viz., a net made of tarred cord, and for cattle and horses in the form of a bag capable of containing 5 or 6 lbs. of hay, For ponies or sheep in a pen or hold the net would require to be made oblong, of sufficient length to stretch across, secured at the ends to the sides of the pen or hold, and supported by light stakes when necessary. For horses and cattle, a bag-net should be suspended alongside of each animal's head, or, if made a little larger, one between each pair of animals might be found sufficient. The use of nets in the feeding of animals with hay is perhaps less known on the north side of the Tweed than on the south side; but, from personal observation and experience, every confidence is felt that the net, in one form or other, is capable of being adapted for the purpose in view, and that it offers greater facilities, when the requirements of a steamer are considered, than any other apparatus yet tried. Its chief advantages are these—it is very portable and cheap; the hay, when once in it, is secure from the effects of wind, so that it forms the best vehicle for conveying hay in a steamer from the store to the stock, and for preserving it when placed before them—(hay might be put into the nets before shipment); it occupies the least possible room when not in use; it won't become sour or injuriously dirty; and it will allow the animals to consume the food with less waste than an ordinary rack, while its use, as suggested, would place the supplies within the reach of each animal; and we therefore, without hesitation, suggest it as the best apparatus for supplying food to stock on board steamers.

The supply of water, fortunately, presents much greater facilities than food; and, bearing in mind the reversal of the animal's position, already suggested as a *sine qua non*, we offer the following arrangement:—Let a small service-tank be erected on some elevated portion of the steamer (such as the small portion of deck usually built over the bowsprit), if possible sufficiently high to send water by gravitation along the deck, the supply of which alone requires the elevation of this tank above the main deck. This service-

tank may be supplied from the general tanks (probably themselves requiring enlargement) by help of the engine at any time, and from it let pipes be laid along the deck, near to the line of the heads of the animals arranged along the bulwarks and sides of the holds, having taps at intervals of 20 feet or so, to which a gutta-percha pipe can be screwed. One set of pipes would supply both the deck and upper hold—the lower hold being supplied by a set of pipes laid in the floor above it. With such an arrangement as this the watering of the stock would be made comparatively easy; to effect it, the cattleman, keeping up the service-tank supplies, and having screwed on his gutta-percha pipe (10 or 15 feet long), would take it in one hand, and with a pail in the other (light movable wooden troughs being used for sheep), would pass from beast to beast, supplying each in turn in probably not more, on an average, than one minute each; and this would in general be quick enough for all practical purposes.

The only objection to this system that occurs as likely to be made, is on the score of expense; but even although it entailed increased storage tankroom, the whole apparatus for a large steamer could not cost a larger sum than would be repaid tenfold by the benefit to the stock; and when it is further considered that water might thus be supplied without interfering with almost any of the existing arrangements of a steamer, and that quickly and conveniently too, the matter of expense becomes very small, and does not appear as a very great objection to such a mode of supply, and we therefore suggest it as the best arrangement possible in the circumstances.

The only other evil of this mode of transit to which we can allude here, is the knocking about, the falls, and consequent trampling, suffocation, and strangulation, to which cattle and sheep are especially liable during rough weather, and which appears to be simply, as to the last named results, the effect of overcrowding. The animals are packed together as closely as they will stand, and when an ox falls, through its feet slipping on the slimy boards, the chances are very great that the animals next it on both sides will be thrown down on the top of it. This is easily understood, when it is remembered that the animals standing together in a row press mutually against each other; the moment, however, a vacancy is made by the fall of one, this pressure tends to fill up the space left, by pushing the adjoining beasts until they meet over the fallen one, which then has scarcely a chance to regain its feet, even when these don't fall over it; but when this happens, and in a storm, the confusion becomes inextricable, and the lives of three or four animals are lost through such a small accident as the slipping down of one beast. So much is this felt, that almost the whole vigilance of

the cattleman is directed, during the voyage, to the one object of keeping the beasts on their feet, and the difficulties of achieving it can only be fully realised by those who have witnessed the effects of a storm on the occupants of the hold. As a remedy for this great evil, we suggest that, instead of a division plank to every tenth beast as is now usually allowed, a similar plank shall be fixed between each animal. The advantages of this would be very considerable; if a beast did get down it would prevent its being either trampled or strangled to death by its neighbours before it had a chance to get up again, while the support these planks would give to all would relieve the individuals from the swaying and crushing effect now experienced in the rolling of the vessel, and which is productive of much mischief to all except the strongest animals. It may be thought a disadvantage to the introduction of these planks, that such a system would fix the limits of the space allowed to each beast, and that a large animal and a small one would have precisely the same accommodation; further, that these planks would occupy space which might be better employed. To the first of these objections it may be replied, that as nearly all steamers are built with a view to the requirements of the particular station on which they are to be employed, the descriptions and average sizes of the stock usually conveyed could be known, and suitable grades of spaces provided accordingly, and that as the fixing of the spaces would prevent overcrowding and all its attendant evils, a great advantage would thereby be gained; while the greater comfort and security of the animals would more than repay for the extra space occupied, and which, after all, would be comparatively trifling, only an addition of three inches (the thickness of the plank) for each beast, while its cost would be very trifling.

Pigs.—The shipping of pigs is not very extensively practised. It is done by the gangway, or the crane, when the animals are placed in small movable pens and hoisted on board. By the gangway the shipping of pigs is no easy matter, as they invariably refuse to move in any required direction. It is generally effected by seizing one or two of the number, and by main force dragging them along, the sympathies of the herd becoming so excited by the screams of these victims that they are induced to follow them. They are almost invariably kept on deck in open pens; and although naturally they are better fitted for bearing the atmosphere of the hold, their unmanageableness nearly always renders it impossible to get them beyond the deck, and they suffer in consequence even more than the preceding descriptions of stock. Generally they are never offered either food or water, and suffer from the want of them on a prolonged voyage very much. Cold, hunger, and thirst are the chief evils from which pigs

suffer on board a steamer, and to mitigate them somewhat, we propose that the pens in which they are placed should be boarded and roofed over, as already described for sheep; in addition to this, a sparred floor should be put in their pen, raised about six inches above the deck floor, so that the water and droppings from them would pass through and afford the pigs a dry bed. This alone would be a great benefit to them, as the wet and filth of the pens, in which they are usually to be seen after a few hours' sailing, increases the evils of exposure in a very high degree. Further, after the pigs are placed in the pen, a quantity of clean dry straw should be shaken over them, as the best covering they can have; and if they have a dry bed, and a good straw blanket such as this, rain being kept off, they will stand the voyage pretty fairly. The sparred floor suggested should be made movable, for the purpose of cleaning; and although this floor would entail expense, it need not be very costly, and it certainly would add much to the comfort of the pigs. Food and water ought to be combined, and with light wooden troughs, which might be readily placed in or taken out of the pens, there does not seem any reason against the proper feeding of pigs on shipboard. Some kind of liquid food, such as meal boiled in water, or meal mixed with whey or brewery wash, might readily both be carried, and supplied at least three times a-day, without any great amount of labour. It is therefore submitted, that the greatest of the evils under which pigs labour during transit by sea may with comparative ease be remedied.

Before concluding this section, it seems necessary to notice the subject of cleaning, in reference to all descriptions of stock on board a steamer. In general, no cleaning beyond the washing of the deck is attempted during the voyage; and for the stock in pens, perhaps it would entail more labour than can easily be spared to it. However for the stock in the hold, arranged in lines, cleaning is not attended with any practical difficulty; and when the usual want of ventilation in the hold is considered, the absolute necessity of the utmost cleanliness becomes apparent, and the benefits of it must be too well appreciated by all to need the support of any argument. The whole question, in fact, is one of labour—and no great amount of labour either; and it is simply submitted as an absolute necessity, in securing the comfort and health of stock during transit by steamer, that they shall be duly cleaned—the holds three times a-day if possible, and all at least twice a-day; and, further, that after each cleaning a sufficient quantity of chloride of lime, or other disinfectant, shall be scattered on the floors, to purify the atmosphere; and that the pens and holds shall be whitewashed with quicklime between the shipping of each cargo of cattle.

There is just one other consideration which we desire to urge in this section, and that is, the placing of all stock-carrying vessels under the supervision of government inspection, and that a code of rules be prepared, setting forth the space to be allowed to each, ventilation, food, water, and sanitary arrangements generally, which would meet both the requirements of the animals and the necessities of the steamer.

The only argument submitted in evidence that this is required is one of analogy, drawn from the experience of passenger vessels; and if it has been found that human beings cannot be trusted in these vessels without constant supervision, how is it to be expected that cattle and sheep will be better treated? Therefore, until the law steps in with active practical supervision, it is much to be feared that there will be but comparatively little mitigation of the many and great evils from which stock now suffer.

Transit by Rail.—This may truly be called the great mode of transit in these modern days, if the numbers and distances be considered, and its benefits and evils are widespread in proportion.

The Horse.—In this, as in all other modes of conveyance, the horse has more attention bestowed on him than any other animal. The "boxes" in which they are conveyed are too familiar to need description. Usually they are constructed to carry three animals, have a compartment for the groom and a box for provender, so that they afford every facility for the comfortable and safe conveyance of the animals. Moreover, as they usually are attached to passenger trains, and so insured rapid transit in addition to their other advantages, they may be looked upon as first-class passengers amongst stock, and dismissed on the ground that their wants are as well supplied as are the wants of first-class passengers usually. There is one point, however, which should not be overlooked, viz., that notwithstanding this seeming comfort, clothing, and all the rest of it, a great number of horses catch cold during transit, and this appears to be wholly attributable to the draughts, from which no horse-box seems to be free. The remedy we would suggest is, that instead of the louvre windows in these carriages, which are made fixed usually, moveable louvre boards ought to be used, so that the person in charge of the animals can regulate the openings with sufficient nicety to give abundance of fresh air without causing a chill, and that a ventilator over the head of each be inserted, under control, thus causing a current of air only where required.

Occasionally inferior horses are carried in cattle trucks, just as so many oxen, a practice altogether to be condemned. However, if it be found necessary sometimes, the considerations affecting

cattle in similar circumstances apply with greater force to them, and need not be advanced here, as this case may be considered an exceptional one. We therefore leave the horses to take care of themselves, and turn to

Cattle—perhaps the most important group in this mode of conveyance. The animals are walked into trucks (sufficiently well known in appearance) from a stage. These trucks are made in three sizes, usually to hold (officially) eight, ten, and twelve cattle respectively; but as they are charged for by a mileage rate,—generally from 5d. to 6d. per mile,—the practice is to put as many beasts into them as can be packed, the only difference made by the railway company being between half and full trucks—that is, if the number of animals does not exceed the official half-number of the truck, a certain reduction is made in the charge; but if a whole truck be taken, the company takes no notice of whether there be only the official number put into it, or half as many more.

Cattle are ordinarily conveyed by goods trains, which, including stoppages, average a speed of from eighteen to twenty miles an hour. But between certain stations, where cattle traffic is large, special through trains are sometimes run, which, travelling at about thirty miles an hour, shorten the period of transit very much. As these, however, are exceptions to the general rule, the ordinary character of cattle transit is not much affected by them.

After the cattle are placed in the trucks and the doors closed on them, nothing more is done until the doors are opened again at their journey's end. They are never offered either food or water by the way, and the only change in the monotony of their journey consists of the stoppages and shuntings at the various stations along their route; indeed, it may with truth be said that the fact of the occupants of these trucks being alive, is not to be discovered from the treatment they receive from the railway company, but are shunted backwards and forwards, and left standing often for hours together without either shelter or shade, just as so much coal; and when it is considered that cattle are often carried along in this manner for two, and even three days, it is not surprising that the results are anything but satisfactory; but perhaps it will be better to glance at these in detail.

The first evil of this system which strikes an observer is the overcrowding of the trucks. This, however, is not an evil of the system itself, but arises from the greed and narrow-mindedness of certain stockowners, who in this way try to lessen the expense of transit per head. The remedy for it seems simple enough, viz., that the railway company should only allow the official number (supposing these to be properly gauged) to be put

into each truck; or a rate per head might be substituted for the usual mode of charging. Indeed, the latter mode would be a decided improvement for other considerations beside this. If such a plan of charging were adopted, the disadvantage under which single animals—or any number of animals less than a full truck load—at present suffer from the proportionally higher rates they are charged would be obviated, while the railway company would not lose, being compensated by the fares of the numbers carried in excess of the proper truck numbers, thus equalising the fares of all; in fact, approximating the system of fares for cattle to the system applied to passengers.

The next evils to be noticed are, the shaking and knocking about the animals sustain from the jolting of the trucks, and from the concussions of stopping and starting, much increased by the frequent shuntings. It may be impossible to carry on railway traffic without these shuntings, still a great deal may be done to mitigate the evils of them; and we recommend—first, that cattle trucks be constructed with spring buffers, similar to those supplied to passenger carriages and to horse-boxes, instead of the usual box-spring buffer of trucks; secondly, that screw couplings be used instead of the ordinary chain couplings, and that these be tightened up in the same manner as in passenger trains. In this manner the vibration of travelling, and the concussions of stopping and starting, would be immensely reduced, and the comfort of the animals thereby greatly enhanced. This will be fully appreciated if the difference between the starting or stopping of a passenger and of a goods train be observed; and considering how trifling comparatively the expense involved would be, it is surprising that this has not been done long ago. If, in addition to these improvements a rule was made that stock trucks were always to be placed next the guard's van, so as to have the least possible amount of shunting, these evils would be reduced to the minimum.

Another evil is, the great and grievous delays which are constantly befalling stock in transit. These nearly all happen at a "junction," and are caused by the necessity for splitting up the train to allow different parts of it to go in different directions. Many of these delays are caused by sheer carelessness and neglect, but, for the most part, they are incidental to the present system. As a general rule, railway companies try to run their goods trains as punctually as passenger trains, with, of course, more time for the distance, but, practically, the delays are so numerous and uncertain, that the time a goods train will take over a certain distance can scarcely be calculated, especially where it has to pass over the lines of different companies. For this evil remedies are difficult in proportion as railway companies are difficult to bring under pressure. If they could be influenced,

there is little doubt that the transit of stock might be greatly hastened by a little management; but unless the matter is a very glaring one they are difficult to reach, and we would rather propose a legislative enactment, such as that a train (principally for the accommodation of stock), regulated as to time, shall be run each way every day, and with suitable penalties for shortcomings. Until stock traffic is separated from ordinary goods traffic, so as to be freed from the delays incidental to the latter, we fear there will be little amendment in this matter; but considering the large development of the cattle trade of the country, it does not seem that one train per day, each way, would be too much to ask for it.

There are several minor evils of this system; such as the damage the animals sometimes inflict on each other, but they require little notice, and we therefore proceed to what may be truly called the great evils of this mode of transit, viz., exposure, hunger, and thirst. All three are caused by the form of the truck in which the animals are carried. These trucks are generally of two forms; the simplest having the sides and ends boarded up to four feet from the floor, with two or three rails covered round the top; the others have in addition the ends carried up to the top, and a light roof over them. In the open trucks, it needs little argument to prove that the animals suffer extremely from cold; one look at them after a night journey in winter will convince the most sceptical, and even in summer it is too much for them. In the covered trucks they are much more comfortable, but still they suffer from the tremendous draught that rushes through the open sides of these trucks during transit. As a remedy for the evil of exposure, we propose, taking the ordinary form of truck as a model, to have the two ends boarded up to the top, the upper half of the sides to have movable louvre boards, which admit of being regulated according to the necessities of ventilation, and that may be turned either way to suit the direction in which the truck is moving, the lower half of the sides to be boarded, and along the top, which must have a roof, a ventilator with louvre openings, thus placing the whole ventilation of the truck under complete control, and mitigating very perceptibly the evils of exposure, which in general terms may be stated as the loss of condition and inflammatory colds.

The questions of food and water come next, and are unfortunately more difficult to deal with. There always will be a class, probably, which can pretty well dispense with these requisites, such as are not to be in the trucks longer than eight or ten hours, and fat stock perhaps a little longer; still the great bulk of stock do require attention very urgently in these matters. So far as we are aware, there are no statistics in existence showing the loss of weight which stock suffer during a railway journey, or the colds, inflammations and other ills engendered by its pri-

vations; yet it is a fact patent to all who have observed the consequences of the present system, that these evils do attend all transit by rail more or less, and especially when the journey exceeds twenty-four hours. If any one be in doubt, let him take an animal and keep him in a house for one, two, or three days without food or water, and observe the effects there; and if to these be added the exposure of a railway truck in all kinds of weather, we believe the result will prove irresistibly that food and water are absolute necessaries in railway transit. The truck presently used has no accommodation for the supply of these; and it seems practically impossible to take the animals out of them, from time to time, to feed and water them. The only thing, therefore, that can be attempted, is to fit up the trucks in some way for this purpose, and the following is submitted as feasible, viz., that the trucks be made one foot three inches higher (admissible), and that a rack, made of iron rods, be run along each side of the truck; the roof over it being made in the form of a door, to open, when required, for filling it. This would not interfere with the accommodation of the cattle at all, and would at once provide for the supply of hay to them as often as required, while it would be so simple and inexpensive that it could hardly be objected to, either on the score of cost or difficulty of construction. But, supposing the rack fixed, some arrangement must be made for its regular supply. This might be done in the following way:— Let the railway companies provide a supply of hay at all their large stations, and make it compulsory to supply the animals, at least once within every six or seven hours, with a certain weight of hay per beast, and for which they are to be allowed a fair charge. Let this department be put under a responsible official, who will order a supply when necessary, see it given, and grant a receipt which would accompany the stock, showing what the animals had got, and when, and for which the owner would pay at their journey's end.

We have no doubt that railway companies would find contractors ready to undertake such a department as this, as readily as they find them to undertake their refreshment rooms. In regard to the supply of water, the difficulty is great. It is hardly possible to supply it satisfactorily inside the trucks, from the inconvenience the necessary troughs would cause, and from the difficulty of filling them, and therefore the following method of supplying the animals with water from the outside is submitted. Let the upper half of the sides of the truck be made in the form of doors, to open outwards. These being opened, there would be nothing to prevent the cattle stretching their heads out and drinking from a trough alongside. The trough for this purpose would be raised to a suitable height on a wall or pillars, and placed on both sides of a siding for the purpose, and of a length

to suit the average length of the trains. The trough might be kept always full of water, and would enable a train of cattle to be watered in little more time than was required to open and shut the doors. The expense of such a system might be alleged against it, but there does not appear to be any great practical difficulty in the way, and as these watering places would only be required at the large stations, the cost could not possibly overbalance the immense benefit to be derived by the stock.

Sheep suffer during transit by rail from all the evils noticed as affecting cattle, although from some of them in a less degree. The mode of conveying sheep by rail being in many points identical with cattle transit, it will only be necessary to notice here the points of difference.

First, as to the trucks in which they are conveyed,—usually the ordinary cattle truck, or else what is called a double sheep truck. The latter, familiar enough in form, is simply a truck with two stories; its ends are boarded generally, and its sides enclosed with iron rods. The floor of the upper story forms a roof to the lower, while the upper also has a roof over it. The space between the floor and roof of each seldom exceeds three feet in height, and as there is no means of ventilating the interior, save the draught from the outsides, which in this case, unfortunately, is too much stopped by the fleeces of the occupants, the closeness of these becomes almost suffocating in the centre, when perhaps at the outside the sheep next to the rails are starved with cold. Unless for the consideration of the large number of sheep which this truck carries, usually 70, while an ordinary truck carries 40, there is no redeeming point about it: it is utterly bad, and as the requirements of railways as to the height of trucks are such that it is impossible to construct one of two stories, with any regard for the comfort or wellbeing of the sheep, this form of truck ought to be condemned altogether.

In the ordinary cattle truck sheep travel very comfortably, and should have no roof over them in summer, but are the better of it in winter. The chief evils which afflict them are the want of food and water; and although it is somewhat difficult to bring these within the reach of each individual in a truck, still a good deal might be done. We suggest the following method as the best:—In trucks that are to be used for sheep only, iron racks might be fixed along the sides and ends, sufficiently high not to interfere with the standing room, and yet within the reach of the sheep. These might even be made to fold up when not required, and the truck used for other purposes without detriment from the presence of the racks. Should, however, permanent racks be found inconvenient, the object might be obtained by placing two movable bars of wood along the middle of the truck, longitudinally, say four feet apart, with a net stretched between, on which hay

could be placed. This would put the hay within the reach of all the animals, and although an objection might be made to this method, from the interference with ventilation which the hay would cause while on the net, yet it can hardly be supposed that a lot of hungry sheep would allow it to remain long enough above them to cause any serious harm in this way, and therefore such a system may be practicable, as neither the expense nor the difficulty of erecting the net can be pleaded against it.

Water is difficult to supply from the outsides, because the sheep in the centre of the truck are beyond its reach, unless the animals could be moved round a little within the trucks; but this would cause a good deal of labour. Any system of supply inside the trucks, however, would certainly require a great deal more, and an arrangement of watering-troughs, similar to those recommended for cattle, but adapted for sheep, is suggested. These would require to be placed lower, and closer to the trucks, than for cattle, and would be altogether smaller and less expensive. Then, to enable the sheep to drink from them, a plank in the sides of the truck, at a suitable height, would require to be hinged, and made to fold down inside like a door. This latter part of the arrangement would be extremely simple, and the construction of suitable troughs does not seem a very difficult matter either; so that although this system might sometimes fail to reach every individual sheep, it would perhaps afford the greatest facility to the greatest number that can be achieved in a simple and easy way.

Before dismissing the sheep, we recommend as the best truck for its conveyance the ordinary cattle truck now in use, without a roof, but with a light framework over which a tarpaulin might be stretched when the inclemency of the weather required the shelter of a roof.

Pigs.—These, as may be anticipated, suffer even more than the preceding kinds of stock during transit by rail. They are usually put into cattle trucks, and left to take their chance against the evils of the way, without attention of any kind. Being naturally highly susceptible of cold, they suffer more perhaps from this than any other cause, although the want of food and water also affects them most severely. The first thing towards the improvement of their condition during transit is to place them in closed, covered, and ventilated trucks, such as are recommended for cattle. In these also should be fixed movable sparred floors, as recommended for pigs in steamers, that they may be able to lie dry; and if a covering of straw could be added, their comfort would be most materially increased.

In regard to food and water, the only thing that can be done is to supply them with liquid food by means of light movable troughs placed inside the truck. This certainly would entail a

considerable amount of labour, but there seems no other way of managing it; and considering the smallness of the amount of pig traffic, it might be accomplished without any great difficulty. With arrangements such as these, we believe pigs might be conveyed by rail any distance without much harm.

Before closing this section, we recommend the placing of stock transit by rail under strict government inspection, as without some constant supervision, and a readier means of investigating grievances and punishing neglect than now exists, it is hopeless to expect much improvement in the system of railway transit.

We now approach the last section of our subject, viz., Disease in reference to Transit. It is scarcely possible to over-estimate the importance of this consideration. Disease in the located individual may mean death to that animal, and danger to a certain number of animals in its immediate neighbourhood; but at the utmost this is limited to a circle, and that not a large one, but in the individual in transit the danger is increased tenfold. A single animal may carry infection along many miles of road, or into half a dozen counties, and therefore the evil of disease is greatly intensified by the mere fact of the transit of the animal. The subject may be divided into two parts, viz., disease existing previous to transit, and disease engendered during transit.

The first of these is perhaps the most important, and unfortunately is too patent to all to need proof, if proof were required, viz., that stock labouring under disease is constantly being sent to market; of course, disease in a perceptible stage is not meant, but disease in a stage too incipient to be detected by the sharpest and most practised eye, though none the less real and dangerous on that account. Reference would only have to be made to the passing record of agricultural matters to find, almost any day, the fullest illustrations of the fact; but for the most striking proof perhaps that can be adduced, the history of the cattle plague may be taken not only as establishing the fact of diseased animals being moved about the country, but also as showing the disastrous effects of such traffic; and although in pleuro-pneumonia, scab, and other infectious diseases, the results are not so well marked as in cases of cattle plague, they are nevertheless equally real and far more destructive; for although that pestilence swept off its hundreds of thousands, it lasted but a comparatively short time, and all its ravages were known; whereas these other evils are constantly at work, and one-half of the loss they cause is never published. Without, therefore, giving a list of details, which the experience of most farmers can only too readily supply, we assume it as an established fact, and one, too, calling most urgently for remedy.

A complete remedy for an evil so gigantic and so subtle may

be hard indeed to find, yet, looking at the experience gained during the cattle plague, there appears good reason to hope that some of the measures then applied might, if adopted as permanent regulations, be most beneficial in checking this mischief.

Taking these as a pattern, we recommend, as a first step, the enactment of a law, that all stock shall be provided with certificates of health previous to being moved over any public road or in any public conveyance; that these certificates shall contain a description of the stock, the route to be followed, and its destination; and that they shall be signed by the owner, and also by an authority competent to judge of the state of health of the animals.

Here arises the first difficulty, how is the "competent authority" necessary to such a system to be achieved? During the prevalence of cattle plague, this authority was constituted variously (see Vict. 29, cap. 2, and the various Orders in Council on the subject); but without following these in detail, we sketch from them the outline of an authority both practicable and probably sufficient.

First, A declaration, signed by the owner, setting forth the number, description, route, and destination of the animals; that the animals have been (at least) four weeks in his possession, and are in health; and that no disease has been on his premises for the three months preceding the date of the declaration.

Secondly, A declaration, signed by two tenant-farmers, each paying an annual rent of more than L.100, attesting, after inspection, the truth of the owner's declaration, both declarations to be enforcable by suitable penalties for fraud or non-compliance.

Let this certificate be carried along with the stock, and be made forthcoming to the inspection of the police or any stock owner. When stock are taken to market and there sold—over and over again perhaps—let the certificate be simply endorsed by each successive purchaser. When the lots are divided, let an attested copy of the original certificate be given with each part of the lot. Further, we recommend that every public market-place should be licensed, and placed under the authority of a qualified veterinary inspector, whose duty it would be to examine the certificate of all stock as it entered, stamping them with the name of the market-place, date, &c. The benefit of a system such as this would be the greatest possible facility in tracing a lot of animals through any number of hands and places up to their original starting-point, and thus reaching the real offender in cases of diseased animals. It would also in great measure stop the movement of animals from places where disease has broken out. Nothing is more common than for farmers, among whose stock a serious disease has appeared, to send to market the whole of the apparently healthy animals—too often proving, however, to

have carried with them the seeds of disease, and thus spread the mischief tenfold. The chief objection against it would be the trouble involved; but it should be borne in mind that, without some trouble to all owners of stock, it is idle to expect any improvement of any value; and as stockowners are principally interested, it may be well worth their consideration how much trouble might not be well spent on any system that would increase the security of their property from contact with disease. And as these certificates could be scheduled and printed, leaving only the special particulars of each case to be written, which could scarcely occupy more than one minute, the only labour required would be the inspection, and without this no measure can be of any use; and we suggest inspection by two farmers in preference to a paid district inspector, because their declaration would be more valuable as regards some points, and if less so in others, it would be done gratuitously, being simply a neighbourly office, which farmers may very reasonably be asked to do for each other.

The second division of the subject, viz., disease engendered during transit, is more difficult of direct proof than the former, inasmuch as the evidence is more difficult to reach, and in itself only circumstantial at best—whereas the other cases admit of direct proof; and, therefore, while actions at law to recover against the first-named evil are frequent enough, scarcely anything is ever attempted in the latter, notwithstanding the frequent occurrence of cases where the evidence seems almost conclusive. The chief want that is felt in regard to this matter is a series of statistics, showing the state of health of the animal when placed in the conveyance, when taken out of it, and also after the elapse of a period sufficient to develop any disease that might have been therein contracted, carried over a considerable period of time, and including a large number of animals. From such statistics alone, carefully prepared and fully noting all the incidents, can safe general conclusions be deduced. Judging, however, in the absence of statistics, by individual experience alone, there seems to be little doubt that disease is very frequently contracted during transit, either by infection from the conveyance itself, acquired in carrying stock that are actually under disease, or induced by the privation to which the animals are subjected. For the former of these, the best remedy appears to be such a system of inspection, and provision of a bill of health, before stock can be moved at all, as has been already suggested, and to a careful disinfection of every public conveyance between the carrying of each lot of stock. The latter is now done by the railway companies, by whitewashing the inside of their trucks, and scattering a little chloride of lime over them, and a similar rule ought to be applied to every public conveyance for stock.

For diseases induced by privation, remedies must be found by providing better accommodation for the animals; and having in the preceding sections given suggestions in detail for the accomplishment of this object, we need only here enumerate the chief items required. They are proper food, rest, and shelter for stock travelling by road; shelter, ventilation, food, and water by sea; and shelter, with ventilation, food, and water by rail. And were stockowners only properly alive to their own interests in this matter, means of remedying these evils would be found, of one sort or another, and that ere long.

The next question that arises in connection with this subject is, What ought to be done with animals taken in disease in transit? First, We suggest that a rule be definitely settled what diseases shall—having consideration to the exigencies of transit, and to the practical value of medical treatment, and also risks of infection—be considered as warranting and requiring the destruction of the animal affected, together with the placing of its companions in quarantine, or also their destruction. That even the last alternative may be necessary in extreme cases, we believe the cattle plague has sufficiently established. Secondly, What diseases may be considered as requiring the quarantine of the affected individual and its companions, and apply them accordingly. Then let the application of such regulations be placed in the hands of the police, under the authority of the magistrates, who shall grant the necessary order, on the certificate of a duly qualified veterinary surgeon. With such a system quarantine grounds would be required; and although the establishment of these might be a serious difficulty, yet the necessity for them is great; and as they would only be needed at considerable distances apart, probably only near the towns, they might be got.

As a necessary consequence of these regulations, the question arises, On whom would fall the loss for animals slaughtered or quarantined? We believe there can be only one reply, viz., the owner. Since the days of the cattle plague stockowners have come to regard the destruction of their animals—when attacked by disease—by the government as a matter for which the public should pay; but as we are now considering regulations applicable rather to the ordinary stock traffic of the country than to the prevalence of an epidemic amongst stock amounting to a great national calamity, we believe that the special reasons for compensation which may exist in the latter case do not apply. Disease in this case is equivalent simply to the decay and deterioration to which all things are liable. Merchandise of every kind has in it some element peculiar to itself, that sooner or later would reduce its value or destroy it altogether, and the merchant's ordinary profit must cover this drawback, as well as include the other elements which regulate the price of the com-

modity. And so in this case, stock is simply a description of merchandise, and can claim no exemption from the ordinary laws of trade. The stockowner's ordinary profit must cover the risk of disease as well as any other consideration affecting it; and the operation of these proposed regulations can in no way constitute a claim for compensation, because they would not tend to increase that risk, but to lessen and modify it; and therefore, to propose compensation for animals slaughtered or detained in this way, is simply to propose to insure the stockowner against loss from disease, which of course is preposterous. We therefore consider that this matter does not admit of doubt.

We submit these regulations of transit as sufficient for the ordinary purposes of stock traffic, having consideration to the necessities and peculiar requirements of the trade, being free enough to obviate all danger to the development of the trade, and comprehensive enough to grasp the main difficulty; and although more stringent measures have been already in force, we do not think they are called for under ordinary circumstances, but should be held in reserve for times of unusual danger.

In connection with this part of the subject, a passing allusion seems necessary to the traffic in foreign stock, which, so far as the accommodation in transit for the animals can be regulated by the home authorities, ought to be placed under conditions similar to those proposed for home stock. In regard to the debarkation and transit of this description of stock, experience has proved over and over again that great restrictions are necessary for its safe conduct, and we heartily endorse the proposal that has been made, viz., to assign or license certain ports, at convenient points on our coast, for the importation of foreign stock, and that these ports only should be used; further, that all fat stock so imported be slaughtered there, the offal of which (hide, &c.) be also either manufactured there, or be thoroughly disinfected before being sent inland. Secondly, that all store stock be subjected to a quarantine of twenty-eight days before being allowed to proceed. These restrictions, it is believed, would not materially injure the foreign trade, while they would almost entirely stop the door by which the worst epidemics to which stock is heir have been introduced into this country; and if these restrictions did lessen the foreign trade somewhat, the loss would far more than be repaid in the security thus insured to the home stock, which is certainly entitled to the first consideration in a matter so important.

Having now glanced over this important and wide-spreading subject, and endeavoured to set it forth truly and fairly as it now exists, with all its benefits, wants, and disadvantages, we cannot close this paper without earnestly beseeching the attention and help of all societies and chambers for the promotion of agriculture,

for the consideration and agitation of it, until thoroughly good practical remedies be applied to its many evils. That there are many difficulties in the way there can be no doubt, yet if the main body of agriculturists would but give their attention to it—and it is chiefly a farmer's question—these would soon disappear, and a system would be introduced which, in providing care and comfort for the animals during transit, would far more than repay for any consequent trouble in the immense saving of "condition," injury from disease, and loss by death, which it would effect.

PROCEEDINGS OF THE CHEMICAL DEPARTMENT.

By Thomas Anderson, M.D., F.R.S.E., Chemist to the Society.

ON THE COMPOSITION OF DIFFERENT KINDS OF LINSEED, AND THE CAKES THEY YIELD.

Having had occasion lately to inquire into various matters connected with the adulteration of oil-cake, it became of importance to me to have some information as to the extent to which the composition of genuine linseed from different localities might vary. That it did vary, abundant experience of the analysis of oil-cakes had sufficiently shown me; but from these analyses it was not possible to draw conclusions as accurate as I required, owing to the difficulty to proving the entire absence of foreign contaminations. On looking into the matter, I found that there was really little reliable information on the subject. The number of analyses of linseed on record is small; and though that of cakes is very large, the analyses very rarely tell whether the sample was free from foreign seeds or not. To those who are acquainted with the mode in which commercial articles are prepared for the market, it is obvious that absolute purity is neither to be expected nor found, and that it is necessary to be contented with what may be called commercial purity, in which the quantity of foreign matters is not sufficiently large to produce any perceptible effect on the commercial value of the article. My object being to ascertain what would be the composition of a perfectly pure cake, and what effect would be produced on its value by the presence of such impurities as may be legitimately allowed in a genuine oil-cake, I found it necessary to proceed in another way, and to commence with a series of samples of linseed of different kinds and prices, in which the amount of impurity was ascertained, by determining the weight of the foreign seeds, sand, &c., which could be separated by picking them out, and then analysing the samples, both in their impure and pure state. From these data, it was possible to calculate, on assumptions, the grounds of which

will be afterwards explained, the composition of the cakes which these samples would yield.

It is sufficiently obvious that this mode of proceeding is very laborious for to arrive at perfectly fair averages of the composition of all the different varieties of linseed, some hundred analyses would be required; and as this would have necessarily occupied a very long time, it became necessary to limit the inquiry, and I therefore restricted myself, in the first instance, to twelve samples of linseed, selected so as to show both the differences of locality and of quality.

The first point to be ascertained was the amount of impurity in each sample, which was most easily effected by spreading it out on a sheet of paper, and with a fine camel's-hair pencil brushing the grains of linseed to one side of the sheet and the impurities to the other. The impurities consisted generally of small seeds, such as wild mustard, various species of the genus Polygonum, among which buckwheat (*Polygonum Fagopyrum*) was occasionally observed, and a great variety of small seeds, which it would be impossible to recognise without growing them, which I had no means of doing. In the Indian samples, the seed called Indian rape was recognised.

The following table gives the percentages of impurities in the different samples, and their prices, so far as they are known to me.

Variety.	Price.	Percentage of Impurities.
Irish, . . .	50s. per qr.	1.60
St Petersburg, . .	„	4·17
Do., . .	55s. per 408 lbs.	15·58
Munich, . . .	48s. per 408 lbs.	28·18
Silesian, . . .	„	5·84
Massina, . . .	54s. per qr.	8·50
Black Sea, . . .	59s. per 424 lbs.	10·10
Calcutta, . . .	50s. per qr.	5·78
Good ordinary Calcutta, .	60s. per qr.	19·68
Ordinary Calcutta, .	58s. per qr.	30·73
Bombay, . . .	„	3·94.
Fine Bombay, . .	64s. per qr.	6·32

The inspection of this table shows very distinctly that no relation exists between the purity and price of any sample of linseed; for we see that the Irish linseed, which is practically pure, containing only 1·6 per cent. of foreign matter, brings only 50s. per quarter, while ordinary Calcutta seed, with 30 per cent. of impurity, sells at 58s.; and of two samples of Calcutta seed, sold at the same price, one contains 5 and the other 19 per cent. of impurity. It is difficult to understand how this should occur. It certainly cannot be due to ignorance, for though the eye cannot estimate with accuracy the amount of impurity in any sample, even the most careless observer cannot fail to distinguish the great difference between 5 and 19 per cent. of foreign seeds.

It is clear that buyers and sellers of linseed do not attach the amount of importance to the purity of the seed which might be anticipated, but that they must have some other standard of value by which the price is fixed. What this standard may be it is difficult to say, but I am inclined to think they are guided to a great extent by the appearance of the seed. In this respect, very material differences are observable between the samples, the seeds being in some cases much larger, plumper, and brighter looking than in others. The extent to which the seeds differ in weight will be seen from the following table, giving the weight in grains of 1000 seeds of each of the samples examined, to which I have added the number of cubic feet occupied by 1 ton.

	Weight in Grains of 1000 Seeds.	Cubic Feet occupied by 1 ton.
Irish,	54·48	54·73
St Petersburg,	65·47	49·97
Do.	63·57	51·25
Munich,	73·00	49·60
Silesian,	119·44	51·65
Messina,	144·55	53·07
Black Sea,	73·10	50·41
Calcutta,	82·48	51·66
Good ordinary Calcutta,	85·19	51·64
Ordinary Calcutta,	89·86	51·40
Bombay,	118·40	51·77
Fine Bombay,	118·90	50·00

Here, to a certain extent, size of seed appears to have regulated price, for the Messina and fine Bombay, which are among the heaviest, bear also the highest price; and the Irish and St Petersburg, which are light, cost less than the others, but the connection is not very close. It may be doubted also whether the standard is a correct one, for the value of linseed to the oil-crusher must mainly depend on the percentage of oil it contains; and though this varies in different samples, it does so to a very small extent, compared with the differences in price of the seed. Possibly there may be some difference in the quality of the oil obtained from the seed grown in different localities; but as this is a matter which does not bear upon the particular point into which was the object of my inquiry, it is not necessary for me to consider it more minutely on the present occasion.

As already stated at the outset, my object was to ascertain the composition of the cake which would be yielded by perfectly pure linseed of different kinds. To do this by freeing the linseed from all impurity, and then pressing it, being manifestly impossible, I have proceeded in this way. The seed in its ordinary state, and the pure linseed obtained by picking out the impurities, were separately analysed, and the composition of the cake which it would yield was calculated in accordance with what occurs when the seed is pressed. In performing this operation, the seed

is ground, and is then exposed to heat in a pan heated by steam, a small quantity of water being added to it in the pan. The seed is then introduced into bags made of a coarse kind of cloth, and exposed to powerful pressure in hydraulic presses. The quantity of oil obtained in this way depends, of course, on that existing in the seed, and also on the length of time it is exposed to pressure, which is usually about ten minutes. The oil then obtained amounts to rather more than one-fourth of the seed, and the remainder constitutes the cake. In making my calculations, I have assumed that in every case the residual oil amounts to 9 per cent., and that the water added in damping the seed amounts to 4 per cent. When the calculation is made on this footing, it will be seen that the result approximates closely to that of average oil-cakes.

Irish Linseed.—This sample was remarkably clean and uniform in size of seeds and appearance throughout, the seeds being small and flat. It contained only 1·5 per cent of impurity. It contained—

	Impure.	Pure.	Calculated Composition of Cake of Pure Seed.
Water, . . .	5·70	5·15	11·87
Oil, ...	34·77	35 92	11·67
Albuminous compounds, .	20·06	19·62	25·46
Mucilage, Gum, &c., .	29·22	30·96	40·16
Fibre, . . .	5·55	4·70	5·34
Ash, . . .	4·70	3·65	4·50
	100·00	100·00	100·00
Nitrogen, . . .	3·21	3·14	4·30
The Ash contains—			
Phosphates, . .	1·40	1·55	
Phosphoric Acid, combined with Alkalies, . .	1·09	0·93	
Sand, . . .	0·80	0·05	

A moment's inspection shows that the calculated composition of the cake which this seed should yield tallies well with that of an ordinary average quality. The ash, indeed, is somewhat lower than is usually found, but it must be remembered that in this case every impurity was separated, while in practice the best of linseed must always contain dust and a few foreign seeds. In this particular case the impurity contained in the seeds consisted chiefly of a small seed, apparently charlock or wild mustard, and its quantity was far too small to have any effect on the composition of the cake.

St Petersburg Linseed, No. 1.—A good sample, with 4·17 per cent. of impurities, consisting of a mixture of all the seeds usually found in linseed.

	Impure.	Pure.	Calculated Composition of Cake yielded by the Pure Seed.
Water, ...	8·25	7·85	14·48
Oil, ...	34·65	36·70	11·78
Albuminous Compounds, .	20·00	21·62	28·46
Mucilage, Gum, &c., .	21·75	24·78	32·50
Fibre, ...	10·20	6·10	7·87
Ash, ...	5·15	3·75	4·91
	100·00	100·00	100·00
Nitrogen, . . .	3·20	3·46	4·53
The Ash contains—			
Phosphates, . . .	2·10	1·55	...
Phosphoric Acid, combined with Alkalies, . .	0·76	1·08	...
Sand, ...	1·15	...	...

St Petersburg Linseed, No. 2.—This sample contained 15·58 of impurities, which consisted largely of wild mustard, and several other small seeds, most of which appeared to be oleaginous, an opinion borne out by the results of analysis.

	Impure Seed.	Calculated Composition of Cake from Impure Seed.	Pure Seed.	Calculated Composition of Cake from Pure Seed.
Water, . . .	7·54	14·66	7·65	15·31
Oil, ...	34·33	11·44	36·22	11·71
Albuminous Compounds,	20·56	26·14	22·19	28·88
Mucilage, Gum, &c., .	23·08	29·33	20·50	26·66
Fibre, . . .	8·90	11·33	9·55	12·38
Ash, ...	5·59	7·10	3·89	5·06
	100·00	100·00	100·00	100·00
Nitrogen, . . .	3·29	4·18	3·55	4·62
The Ash contains—				
Phosphates, . .	1·84	...	1·60	...
Phosphoric Acid, combined with Alkalies,	0·46	...	0·60	...
Sand, ...	1·60	...	0·19	...

Here the presence of 15 per cent. of impurities has produced an appreciable effect on the composition of the cake which would be yielded by the seed, an effect, however, restricted mainly to the albuminous compounds, and to the mucilage, &c., the former being diminished by rather more than 2½ per cent., while the latter is higher to about the same extent. The ash of the impure cake is also higher, as it must necessarily be, from the presence of sand and dirt which must inevitably be found in greater or less quantity in all samples of linseed.

Memel Linseed.—The seeds in this sample were small in size, somewhat dull on the surface, and it contained 28·18 per cent. of impurities. These were of various kinds. Wild mustard and

dodder were found, though in small quantity. Grass seeds were abundant, and there was a perceptible amount of the small black seeds which the eye often detects in inferior oil-cakes. They are the seeds of various species of the genus Polygonum. The sample could not be considered as adulterated, for all the seeds found in it were those of plants which had grown along with the flax. The seed was remarkably free from sand. Its composition was—

	Impure Seed.	Calculated Composition of Cake from Impure Seed.	Pure Seed.	Calculated Composition of Cake from Pure Seed.
Water, . . .	7·90	13·88	6·15	15·00
Oil, ...	27·30	10·50	34·85	11·52
Albuminous Compounds,	16·72	19·51	18·63	23·84
Mucilage, Gum, &c., .	36·13	42·16	32·47	41·54
Fibre, . . .	7·70	8·99	4·50	5·75
Ash, ...	4·25	4·96	3·40	4·35
	100·00	100·00	100·00	100·00
Nitrogen, . . .	2·67	3·11	2·98	3·81
The Ash contains—				
Phosphates, . .	1·30	...	1·63	...
Phosphoric Acid, combined with Alkalies,	0·70	...	0·73	...
Sand, . . .	0·50	...	0·10	...

Here the large quantity of impurity produces a marked effect on the composition of the cake, and again the effect is chiefly in diminishing the percentage of albuminous compounds. This is due to the fact, that the seeds with which the linseed was mixed consisted largely of species remarkably poor in albuminous compounds. In this case the quantity of impurity was so large that it was easy by picking to obtain a sufficiently large quantity for analysis, which gave the following result:—

Analysis of the Impurities of Memel Linseed.

Water, ...	9·40
Oil, ...	9·05
Albuminous Compounds, ...	12·06
Mucilage, Gum, &c., ...	54·49
Fibre, ...	8·65
Ash, ...	6·35
	100·00
Nitrogen, ...	1·93
The Ash contains—	
Phosphates, ...	1·85
Phosphoric Acid, combined with Alkalies, .	0·77
Sand, ...	3·35

The low percentage of nitrogen in this mixture necessarily produces a marked effect on the cake in which it is contained. The small proportion of oleaginous seeds contained among the impurities, as indicated by the proportion of oil, is also to be noticed. It may be well also for me to explain, that this does not affect the quantity of oil found in the cake. The fact is, that the presence of non-oleaginous seeds prevents the crusher from expressing as large a proportion of the oil in the mixture as he otherwise would, and hence it comes that when seeds containing very different proportions of oil are pressed, about the same residue of oil is left in the cake.

Silesian Linseed.—An excellent sample, consisting of large, plump grains, 1000 seeds weighing 119·44 grains. It contained 5·84 per cent. of foreign seeds.

	Impure.	Pure.	Calculated Composition of Cakes from Pure Seed.
Water, . . .	8·80	5·85	13·12
Oil, ...	35·80	37·97	11·98
Albuminous Compounds,	18·31	4·31	28·40
Mucilage, Gum, &c. .	20·49	23·62	31·38
Fibre, ...	10·55	7·80	10·53
Ash, ...	6·05	3·45	4·59
	100·00	100·00	100·00
Nitrogen, . . .	2·93	3·41	4·55
The Ash contains—			
Phosphates, . .	1·25	1·70	...
Phosphoric Acid, combined with Alkalies,	1·30	0·70	...
Sand, . . .	2·10	...	...

In comparing these analyses, it will be noticed that there is a very considerable difference in the percentages of water found in the pure and impure linseed. This is due to the seed becoming dry during the picking out of the impurities. This process is a slow one, several hours being required for the purpose of picking the necessary quantity, and as during the whole of this time the seed remains spread out in a thin layer, the effect in hot and dry weather is very marked. This is an unavoidable consequence of the mode in which the experiments are made, so that in practice the cake actually obtained in this case would contain more water than is here given, and be somewhat inferior to the analysis, though still of excellent quality.

Messina Linseed.—This sample of seed was the finest to the eye, and composed of the largest grains of any of those analysed, each seed weighing nearly $2\frac{1}{3}$ times as much as those of the Irish linseed. It was very bright and clean-looking, but nevertheless contained 8·50 per cent. of impurity. Analysis gave—

	Impure.	Pure.	Calculated Composition of Cake from the Pure Seed.
Water, . . .	7·45	6·05	13·38
Oil, . . .	37·07	37·87	11·98
Albuminous Compounds,	19·40	19·40	25·82
Mucilage, Gum, &c., .	20·63	27·33	36·51
Fibre, . . .	10·80	5·80	7·72
Ash, . . .	4·65	3·55	4·59
	100·00	100·00	100·00
Nitrogen, . .	3·10	3·10	4·12
The Ash contains—			
Phosphates, . .	1·00	1·90	...
Phosphoric Acid, combined with Alkalies,	1·05	0·73	...
Sand, . . .	8·90	0·05	...

Black Sea Linseed.—The seeds in this case were small, only about half the size of the last, and they were flat and thin. The impurity amounted to 10·10 per cent. Notwithstanding this, however, the sample is of excellent quality, and the pure seeds give a cake of high quality. The foreign seeds appeared to be almost entirely oleaginous. Analysis gave—

	Impure.	Pure.	Calculated Composition of the Cake of the Pure Seeds.
Water, . . .	7·15	7·30	14·65
Oil, ...	33·63	35·90	11·67
Albuminous Compounds,	24·19	23·19	30·08
Mucilage, Gum, &c., .	21·73	24·66	31·98
Fibre, . . .	9·50	5·85	7·60
Ash, ...	3·80	3·10	4·02
	100·00	100·00	100·00
Nitrogen, . . .	3·87	3·87	5·02
The Ash contains—			
Phosphates, . .	9·90	1·50	...
Phosphoric Acid, combined with Alkalies,	1·15	0·69	...
Sand, ...	0·40	...	...

Calcutta Linseed.—Three samples of this variety of seed have been examined—one simply described by that name, the others distinguished as good ordinary, and ordinary, terms which, as we shall soon see, appear to be used in a somewhat lax manner. In all three the linseed is small, but the grains are round. The first sample, which was not distinguished in any special way, cost 50s. per quarter, and contained 5·78 per cent. of impurities.

	Impure.	Pure.	Calculated Composition of the Cake of the Pure Seed.
Water,	7·30	6·15	14·38
Oil,	35·97	37·72	11·95
Albuminous Compounds,	17·12	16·69	22·09
Mucilage, Gum, &c.,	26·86	27·74	36·84
Fibre,	7·80	8·75	10·83
Ash,	4·95	2·95	3·91
	100·00	100·00	100·00
Nitrogen,	2·74	2·67	3·55
The Ash contains—			
Phosphates,	1·40	1·75	...
Phosphoric Acid, combined with Alkalies,	1·10	0·64	...
Sand,	1·35	...	...

Good Ordinary Calcutta Linseed.—This sample contained no less than 19·68 per cent. of impurity, consisting chiefly of oleaginous seeds, among which Indian rape and a few grains of a small variety of Teel seed (*Sesamum orientale*) could be recognised. There were also a good many small fragments of what appeared to be flax straw. Other seeds were present which I could not recognise, no doubt those of weeds which had grown along with the crop.

	Impure.	Calculated Composition of Cake from the Inferior Seed.	Pure.	Calculated Composition of Cake from Pure Seed.
Water,	6·60	14·16	6·00	13·76
Oil,	38·15	12·03	40·37	12·39
Albuminous Compounds,	18·00	24 05	17·37	23·91
Mucilage, Gum, &c.,	19·35	25·85	23·46	32·30
Fibre,	13·65	18·24	9·85	13·58
Ash,	4·25	5·65	2·95	4·06
	100·00	100·00	100·00	100·00
Nitrogen,	2·88	3·84	2·78	3 82
The Ash contains—				
Phosphates,	0 50	...	1·10	...
Phosphoric Acid combined with Alkalies,	0 85	...	0·64	...
Sand,	0·55	...		

The low percentage of albuminous compounds here again merits notice, as well as the larger quantity of fibre. In the impure sample, the excess is explained by the presence of the flax straw. But even in the pure seed it is far above the average of European samples.

Ordinary Calcutta Linseed.—This sample must be described as very ordinary indeed, for it contained 30·73 per cent. of impurities, consisting mainly of oleaginous seeds. In this case

Indian rape was present among the impurities, but not to a very large extent. There were, however, several other small seeds resembling it, and also a few somewhat like the lentil, though certainly not identical with that seed. The seed contained—

	Impure.	Calculated Composition of Cake from the Inferior Seed.	Pure.	Calculated Composition of Cake from Pure Seed.
Water, . . .	5·39	12·16	5·11	12·38
Oil	35·77	11·66	39·42	12·23
Albuminous Compounds,	18·87	24·43	16·31	22·16
Mucilage, Gum, &c., .	21·17	27·41	22·59	30·70
Fibre, ...	12·40	16·06	13·45	18·28
Ash, ...	6·40	8·28	3·12	4·25
	100·00	100·00	100·00	100·00
Nitrogen, . . .	3·02	3·91	2·61	3·55
The Ash contains—				
Phosphates, . .	2·24	0·91		0·57
Phosphoric Acid, combined with Alkalies,	0·38	...	...	...
Sand, . . .	2·55	...	...	...

The impurities in this sample being so abundant as to admit of their being separated in large quantity, an analysis of them was made with the following results; and as the seed contained so much oil that it might be pressed, I have added the calculated composition of the cake it ought to yield.

		Calculated Composition of Cake.
Water, ...	6·25	12·01
Oil, ...	27·60	10·54
Albuminous Compounds, .	21·06	24·66
Mucilage, Gum, &c., .	25·39	29·73
Fibre, ...	8·35	9·77
Ash, ...	11·35	13·29
	100·00	100·00
Nitrogen, . . .	3·37	3·94
The Ash contains—		
Phosphates, . . .	2·50	...
Phosphoric Acid, combined with Alkalies, . .	0·74	...
Sand, ...	6·00	...

Bombay Linseed.—Two samples have been analysed, both of excellent quality, the seeds being large, well developed, and polished on the surface. They were very pure, the percentage of foreign seeds being 3·94 in the one, and 5·32 in the other. The results of analysis of the first sample, containing 3·94 of impurity, were—

	Impure.	Pure.	Calculated Composition of Cake yielded by the Pure Seed.
Water,	6·45	5·70	13·34
Oil,	39·12	40·27	12·37
Albuminous Compounds,	18·25	18·50	25·44
Mucilage, Gum, &c.,	23·78	23·73	32·62
Fibre,	8·70	9·05	12·44
Ash,	3·70	2·75	3·79
	100·00	100·00	100·00
Nitrogen,	2·89	2·96	4·07
The Ash contains—			
Phosphates,	0·50	1·15	...
Phosphoric Acid, combined with Alkalies,	0·75	0·41	...
Sand,	0·65	0·25	...

The second sample, in which there were 6·32 per cent. of impurities, contained—

	Impure.	Pure.	Calculated Composition of the Cake from Pure Seeds.
Water,	5·00	5·55	12·78
Oil,	38·55	38·30	12·05
Albuminous Compounds,	18·75	19·37	25·94
Mucilage, Gum, &c.,	27·05	24·28	32·60
Fibre,	5·85	9·53	12·78
Ash,	4·80	2·95	3·95
	100·00	100·00	100·00
Nitrogen,	3·00	3·10	4·15
The Ash contains—			
Phosphates,	1·70	1·60	...
Phosphoric Acid, combined with Alkalies,	0·48	0·70	...
Sand,	1·30	0·30	...

A comparison of the foregoing analyses shows that considerable variations exist in the composition of the different samples of linseed, though they do not point to any very decided connection between that and the locality in which they were grown. The oil differs less perhaps than any other constituent, varying from about 35 per cent. up to 40. In general, the samples from warm climates appear to contain the largest quantity, but it can scarcely be said that the difference is such as to enable us to say that this is to be considered as a general rule. The albuminous compounds vary more widely, ranging from 16·6 up to 24, and their proportion appears to depend very greatly upon the full development of the seed. In all cases the samples composed of the heaviest seeds are richest in albuminous compounds, and there can be little doubt that in these cases the linseed is also most matured, and probably has been cultivated in a careful and liberal manner. Considerable difference exists also in the

amount of fibre, which varies from 4·7 to 10·0 per cent. It is fair to say, however, that in these determinations I have experienced unusual difficulties. The process usually employed for determining fibre in vegetable bodies, and which for most of them, and especially for oil-cake, gives extremely concordant results, fails to some extent with linseed itself; and notwithstanding the most careful work, it was found that in some cases determinations made in precisely the same manner varied to the extent of as much as 2 per cent., while in other cases no such difference occurred. I am inclined to think that this difficulty is connected in some way with the large quantity of oil contained in the seeds. The error, however, is not very material, and does not exceed 1 per cent. The mucilage, gum, &c., vary also to a large extent, and are of course largest in those cases in which the other constituents are low; but there does not seem to be any connection between their proportion and the locality from which the seed has come.

The composition of the cake obtained from linseed depends of course on two circumstances—first, on the mode of manufacture, and secondly, on the composition of the seed. Under the first head, the variations depend on the quantity of water used for moistening the seed, and the amount of pressure to which it is subjected, in respect to both of which some difference exists. In this country the quantity of water used is such that the cake usually contains from 10 to 14, on the average 12 per cent. of moisture, and the occurrence of samples containing more or less than this is rare. In America, however, a smaller quantity is generally used, because experience has shown that moist oil-cakes are apt to heat during the voyage across the Atlantic, and to be deteriorated by the change. Hence, when cakes are made in that country for the British market, it is customary either to omit moistening the seed, or to do so to a much smaller extent, so that American oilcakes are often met with containing not more than 7 or 8 per cent. of water, with of course a proportionate increase of all the other constituents. Perfection of the machinery, and the length of time the cake is allowed to remain in the press, have a very important influence on the quantity of the oil remaining in the cake. At present, in this country there is but little difference in the kind of presses used in different oil-mills, the construction of such machinery being in the hands of a comparatively small number of manufacturers, and the mode of conducting the pressing being similar in most respects. In general, the cake is kept in the press for ten minutes. The flow of oil, at first rapid, has at the end of that time become so slow that it is not generally remunerative to continue it longer. On the other hand, when the demand for oil and cake is large, and the prices high, the manufacturer is

sometimes tempted to hurry on the process, so as to get a larger amount of material through his hands, in which case more oil is left in the cake.

In the calculated composition of the cakes which would be yielded by the different seeds analysed, I have sought to avoid all questions depending on the mode of pressing, by assuming that this operation has been performed in an exactly similar manner in all cases. The variable results, therefore, which these calculations show, are due to the difference in composition of the seeds alone. In regard to the amount of oil, the variation is very small, and scarcely exceeds 1 per cent., while in most cases it is less even than this. The quantity of water varies to a greater extent; because I have assumed that in all cases, no matter what amount of that substance was contained in the seed, the same quantity was used in moistening before going into the press, and hence possibly I may sometimes have overrated the quantity of water which would be found in actual practice. I have thought it better, however, to adopt a uniform system, than to make any allowance in particular cases.

Turning to the other constituents of the cakes, we notice a greater amount of variation, and this is seen most conspicuously in the albuminous compounds, to which, and to the nitrogen, which is only another mode of expressing the percentage of albuminous compounds, I shall mainly direct attention. The latter, it will be seen, can always be calculated from the former by multiplying by 6·25. The amount of nitrogen, therefore, measures that of albuminous compounds. Now, to the percentage of nitrogen or albuminous compounds great importance must be attached in estimating the quality of different oil-cakes. In regard to the estimation of the feeding qualities of different substances a good deal of difference of opinion exists among different authorities. Some have supposed that, inasmuch as the process of fattening consists to a great extent of the accumulation of fat in the animal frame, the respiratory or fat-forming constituents of the food must possess the highest value; while others attribute, if not the chief, at least a most important, influence to the nitrogenous or flesh-forming substances. Without entering here on the discussion of this difficult question, it may be said that oil-cake, which is the most highly nitrogenous food, has been found by experience to be that best fitted to promote the fattening process; and without underrating the importance of the respiratory substances, it is impossible to doubt that it is the abundance of the former which makes oil-cake surpass other foods which are quite as rich, or even richer in the latter. As indicating the quality of oil-cake, great importance must be attached to the quantity of nitrogen. From the calculated composition of the cake from pure linseed, it appears that the nitrogen may vary from 3·55 up to 5·02. It is

remarkable, also, that the three samples of Calcutta linseed are the only cakes falling below 4 per cent. of nitrogen, and that all the European samples exceed that number, with the exception of one from Memel of very inferior quality. I have always been in the habit of assuming that an oil-cake of the highest quality should contain about 4·5 per cent. of nitrogen, and that which falls below 4· must be looked upon with suspicion; while at 3·5 it is almost certain to be adulterated, or at least, like some of these samples now analysed, be mixed with considerable quantities of the seeds of weeds. So far this opinion must be modified, for we see that an oil-cake may be pure, and yet contain only 3·55 per cent. of nitrogen. But though this may be the case, I must say that among the very many commercial oil-cakes analysed by me, I have never met with a pure sample containing so small a quantity of nitrogen. I believe this to be due to the fact that it is a practice of the trade to mix different kinds of linseed in crushing. I have been told, indeed, that this is particularly attended to with Calcutta oil-cake, which is known to yield a large amount of fibre, and is always mixed with some of the finer varieties, so as to diminish this peculiarity. However this may be, it must not be forgotten that a pure oil-cake, with little more than 3·5 per cent. of nitrogen, is possible. It is doubtless of rare occurrence, and the sample would unquestionably be considered of inferior quality.

On the other hand, fine samples may contain as much as 5· per cent. of nitrogen. But we must guard against supposing that this is in itself a proof of quality, unless we know that the linseed has been free from other seeds or adulterations. If merely the numerical results of the analysis are looked to, a mixture of comparatively cheap articles may be made up, and is made up, which imitates completely the composition of a first-rate oil-cake. I have already so often adverted to this fact, and pointed out that the analysis of a genuine oil-cake should always state in the most distinct terms that it is made from pure linseed, that I should not have mentioned it here at all, had not experience taught me that it is a matter too much overlooked by the farmer, and that numerous instances occur in which, owing to its omission, mixtures made up of very inferior matters pass muster as genuine.

ANALYSES OF THE SOILS AND SUBSOILS ON WHICH THE FIELD EXPERIMENTS OF 1867 WERE MADE.

In the introductory remarks which prefaced the analyses of the soils of the year 1866, I went into some details regarding the kind of analyses required for soils, which render any lengthened observations on the present occasion unnecessary. I particularly pointed

out that one of the most important considerations is to obtain a means of determining not only the total quantity of any substance that exists in a soil, but also its different states of combination, so as to discriminate between those portions which the plant can easily obtain and assimilate, and those which are, as it were, locked up in an inaccessible condition. Hitherto chemists have divided the soil constituents into those soluble in water, those insoluble in that fluid but soluble in hydrochloric acid, and those insoluble in both menstrua. The latter, it has been supposed, and apparently with justice, are at this moment entirely inaccessible to plants, though they may, in the course of time, become accessible, by virtue of those changes constantly induced by the action of air and moisture. On the other hand, it has been supposed that the portion soluble in water must be the most readily available, and the portion soluble in hydrochloric less so, though still capable of assimilation.

The recent researches of chemists on the absorptive power of soils and allied subjects, which show that plants can and do take a great part of their food from the portion of the soil insoluble in water, has diminished the importance of the soluble part; while other experiments tend to show that of the part soluble in hydrochloric acid, a portion, and in some cases a very large portion, may be unavailable. With the intention of making a further distinction between the different states in which the constituents of the soil exist, I last year introduced the use of acetic acid as a solvent, supposing that that feeble acid would give, in the portion it dissolved, an indication of the amount of very accessible matters in each soil. The first impression I derived from these analyses was not of a very favourable character; and therefore, when the analyses for 1867 were commenced, I resolved to omit what is a very troublesome and laborious part of the analysis, and returned to the old plan. More mature consideration has led me to doubt as to the propriety of this; and I now think that the information derived from the composition of the acetic solution was greater than at first supposed, and I therefore regret the omission, which it is now too late to supply.

With this exception, the analyses were conducted in the same manner as last year. As the process, so far as necessary, was described in the Transactions then, it is unnecessary to revert to it here. I must only mention that the quantity soluble in hydrochloric acid includes also that soluble in acetic acid.

SOIL FROM MR DOVE, ECCLES NEWTON.

This was a soil of fair quality, but rather light, and containing but a small quantity of clay. It was pale in colour, and judging from the small pieces of rock it contained, appeared to be formed

by the disintegration of a sandstone containing a considerable proportion of felspathic rock. The subsoil was paler, and more grey in tint. It appeared very similar in all respects to the soil, but contained some fragments of a trap rock. Judging, however, from the small quantity of alkalies found in the analysis, but a small proportion of the soil can have been formed from this substance.

Soluble in Hydrochloric Acid.

	Soil.	Subsoil.
Silica,	·224	·104
Peroxide of Iron,	4·200	6·336
Alumina,	2·580	4·004
Lime,	·504	·470
Magnesia,	·461	·338
Potash,	·038	·131
Soda,	·022	·081
Sulphuric Acid,	·082	·078
Phosphoric Acid,	·064	·025
Carbonic Acid,	·150	·070
Chlorine,	·081	·012
Total soluble in Hydrochloric Acid,	8·406	11·649

Insoluble in Hydrochloric Acid.

Silica,	69·337	73·373
Peroxide of Iron,	·228	·569
Alumina,	12·463	6·408
Lime,	·510	·295
Magnesia,	·419	·263
Alkalies and Loss,	·537	·213
Total insoluble in Hydrochloric Acid,	83·494	81·121
Water,	2·110	1·920
Organic Matter,	5·990	5·310
	100·000	100·000
Nitrogen,	·117	·085
Equal to Ammonia,	·143	·104
Hygrometric Water,	6·860	2·940

Mechanical Analysis.

Gravel,		4·60	22·402
Soil,	Coarse Sand,	79·96	56·150
	Fine Sand,	3·92	·473
	Clay,	5·86	15·768
	Organic Matter,	5·84	5·207
		100·00	100·000

SOIL FROM MR BOWIE, MAINS OF KELLY.

A soil of a very uniform appearance. Pale grey in colour, and free from stones. It is in a fine state of division, and contains more clay than is generally met with in our soils. Such stones as are met with appear to be fragments of felstone. The subsoil

consists almost entirely of coarse sand, among which scales of mica are found in small quantity.

Soluble in Hydrochloric Acid.

	Soil.	Subsoil.
Silica,	·341	·120
Peroxide of Iron,	2·140	2·430
Alumina,	3·280	3·790
Lime,	·470	·336
Magnesia,	·525	·794
Potash,	·180	·130
Soda,	·125	·122
Sulphuric Acid,	·115	·048
Phosphoric Acid,	·114	·022
Carbonic Acid,	·120	·080
Chlorine,	·002	·000
Total soluble in Hydrochloric Acid,	7·412	7·872

Insoluble in Hydrochloric Acid.

Silica,	67·760	71·350
Peroxide of Iron,	1·207	1·303
Alumina,	13·441	13·190
Lime,	·597	·689
Magnesia,	·337	·110
Alkalies and Loss,	·946	·146
Total insoluble in Hydrochloric Acid,	84·288	86·788
Water,	2·374	2·640
Organic Matter,	5·926	2·700
	100·000	100·000
Nitrogen,	·198	·030
Equal to Ammonia,	·240	·036
Hygrometric Water,	3·600	4·080

Mechanical Analysis.

Gravel,		4·832	3·99
Soil,	Coarse Sand,	69·620	91·81
	Fine Sand,	2·018	·75
	Clay,	17·765	·79
	Organic Matter,	5·765	2·66
		100·000	100·00

SOIL FROM MR MUNRO, FAIRNINGTON.

The soil and subsoil in this case had a somewhat greyish tint, the latter rather lighter in tint, but so similar that they could be distinguished only with some difficulty. Both soil and subsoil contained an unusually small proportion of iron. The gravel was large in the subsoil, and consisted chiefly of fragments of sandstone, with a few pieces of a felspathic mineral.

Soluble in Hydrochloric Acid.

	Soil.	Subsoil.
Silica,	·144	1·133
Peroxide of Iron,	·248	1·580
Alumina,	2·692	1·060
Lime,	·369	·224
Magnesia,	·288	·253
Potash,	·154	·077
Soda,	·156	·165
Sulphuric Acid,	·054	·054
Phosphoric Acid,	·127	·126
Carbonic Acid,	·100	·080
Chlorine,	·007	·020
Total soluble in Hydrochloric Acid,	4·339	3·672

Insoluble in Hydrochloric Acid.

Silica,	78·336	87·121
Peroxide of Iron,	·666	·483
Alumina,	8·596	4·319
Lime,	·620	·510
Magnesia,	·513	·185
Alkalies and Loss,	·850	·000
Total insoluble in Hydrochloric Acid,	89·581	92·618
Water,	1·280	·790
Organic Matter,	4·800	2·920
	100·000	100·000
Nitrogen,	·133	·069
Equal to Ammonia,	·162	·084
Hygrometric Water,	3·160	2·850

Mechanical Analysis.

Gravel,		14·57	27·56
Soil,	Coarse Sand,	75·46	61·93
	Fine Sand,	1·99	2·01
	Clay,	3·88	6·31
	Organic Matter,	4·10	2·19
		100·00	100·00

SOIL FROM MR HOPE, FENTON BARNS.

This was a light loamy soil, of a pale yellowish colour. It contained a considerable number of small rounded stones, most of which were fragments of trap, some of them much decomposed, but there were also pieces of what appeared to be a ferruginous sandstone. The subsoil was similar in appearance, but contained a much larger quantity of highly divided matter or clay.

Soluble in Hydrochloric Acid.

	Soil.	Subsoil.
Silica,	·080	·758
Peroxide of Iron,	3·690	1·750
Alumina,	4·390	9·136
Lime,	·291	·601
Magnesia,	·916	1·355
Potash,	·350	·094
Soda,	·416	·053
Sulphuric Acid,	·116	·087
Phosphoric Acid,	·051	·120
Carbonic Acid,	·210	1·120
Chlorine,	·022	·067
Total soluble in Hydrochloric Acid,	10·532	15·139

Insoluble in Hydrochloric Acid.

Silica,	71·976	69·243
Peroxide of Iron,	·613	·111
Alumina,	7·991	8·514
Lime,	·365	·268
Magnesia,	·367	·502
Alkalies and Loss,	·246	·203
Total insoluble in Hydrochloric Acid,	81·558	78·841
Water,	1·620	1·680
Organic Matter,	6·290	4·034
	100·000	100·000
Nitrogen,	·160	·033
Equal to Ammonia,	·195	·041
Hygrometric Water,	4·460	4·700

Mechanical Analysis.

Gravel,		10·97	6·259
Soil,	Coarse Sand,	68·26	59·960
	Fine Sand,	5·09	7·074
	Clay,	9·96	22·569
	Organic Matter,	5·72	4·138
		100·00	100·000

SOIL FROM MR HARPER, SNAWDON.

This is a light soil, containing a large quantity of gravel, amounting in the soil to 41· per cent., in the subsoil to 55·. Its colour is very pale, and the gravel it contains consists almost entirely of angular fragments of some kind of schistose rock, the nature of which it is not possible to define more exactly. The subsoil is remarkably similar to the soil, and approaches it very closely in composition.

Soluble in Hydrochloric Acid.

	Soil.	Subsoil.
Silica,	·316	·036
Peroxide of Iron,	5·270	5·476
Alumina,	2·710	3·510
Lime,	·549	·492
Magnesia,	·382	·360
Potash,	·090	·192
Soda,	·010	·079
Sulphuric Acid,	·225	·137
Phosphoric Acid,	·344	·178
Carbonic Acid,	·050	·070
Chlorine,	·017	·010
Total soluble in Hydrochloric Acid,	9·963	10·540

Insoluble in Hydrochloric Acid.

Silica,	64·403	66·907
Peroxide of Iron,	·859	1·443
Alumina,	14·380	11·169
Lime,	·296	·364
Magnesia,	·454	·384
Alkalies and Loss,	·385	·613
Total insoluble in Hydrochloric Acid,	80·777	80·880
Water,	2·160	1·980
Organic Matter,	7·100	6·600
	100·000	100·000
Nitrogen,	·181	·160
Equal to Ammonia,	·220	·210
Hygrometric Water,	3·410	4·450

Mechanical Analysis.

Gravel,		41·09	55·827
Soil,	Coarse Sand,	44·82	36·072
	Fine Sand,	1·02	·740
	Clay,	8·80	4·388
	Organic Matter,	4·27	2·973
		100·00	100·000

SOIL FROM MR MUSTARD, LEUCHLANDS.

The soil in this case was a loam of somewhat light texture, containing a considerable quantity of small gravel and much coarse sand, with but a small quantity of clay. The subsoil Mr Mustard describes as an inferior sand, but it is remarkable that the mechanical analysis shows a much larger proportion of finely divided matter—that is, of clay—than the soil itself. The chemical analysis also shows a very close resemblance between both—closer, indeed, than is usually observed.

Soluble in Hydrochloric Acid.

	Soil.	Subsoil.
Silica,	·238	·396
Peroxide of Iron,	1·341	3·524
Alumina,	5·699	5·176
Lime,	·358	·257
Magnesia,	·600	·043
Potash,	·379	·267
Soda,	·011	·102
Sulphuric Acid,	·108	·020
Phosphoric Acid,	·051	·076
Carbonic Acid,	·620	·020
Chlorine,	·012	·029
Total soluble in Hydrochloric Acid,	9·417	9·910

Insoluble in Hydrochloric Acid.

Silica,	65·317	68·978
Peroxide of Iron,	1·437	·892
Alumina,	13·012	13·699
Lime,	·710	·712
Magnesia,	·308	·213
Alkalies and Loss,	·159	·346
Total insoluble in Hydrochloric Acid,	80·943	84·841
Water,	2·200	1·270
Organic Matter,	7·440	3·980
	100·000	100·000
Nitrogen,	·180	·110
Equal to Ammonia,	·221	·134
Hygrometric Water,	3·620	2·940

Mechanical Analysis.

Gravel,		14·45	21·239
Soil,	Coarse Sand,	73·40	61·157
	Fine Sand,	1·79	3·128
	Clay,	3·77	11·342
	Organic Matter,	6·59	3·034
		100·00	100·000

SOIL FROM MR NICOLL, LITTLETON.

Mr Nicoll's soil may be described as a somewhat stiff loam of good quality, and remarkably free from gravel, of which it contains only a fraction of a per cent., consisting of fragments of rock of such small size that it was impossible to make out their nature. Its colour was pale brown, and it contained a rather large proportion of small roots mixed through it. The subsoil was very similar, but more sandy. The soil is remarkably deficient in phosphoric acid.

Soluble in Hydrochloric Acid.

	Soil.	Subsoil.
Silica,	·250	·138
Peroxide of Iron,	3·456	1·425
Alumina,	3·419	3·455
Lime,	·292	·107
Magnesia,	·252	·231
Potash,	·165	·295
Soda,	·160	·105
Sulphuric Acid,	·179	·638
Phosphoric Acid,	trace	·001
Carbonic Acid,	·100	·120
Chlorine,	·069	·014
Total soluble in Hydrochloric Acid,	8·342	5·929

Insoluble in Hydrochloric Acid.

Silica,	59·922	67·614
Peroxide of Iron,	1·339	2·419
Alumina,	20·653	14·836
Lime,	·715	1·092
Magnesia,	·430	·750
Alkalies and Loss,	·349	·000
Total insoluble in Hydrochloric Acid,	83·408	86·711
Water,	3·100	1·800
Organic Matter,	5·150	5·560
	100·000	100·000
Nitrogen,	·224	·155
Equal to Ammonia,	·273	·188
Hygrometric Water,	5·100	3·260

Mechanical Analysis.

Gravel,		·758	·016
Soil,	Coarse Sand,	85·988	84 648
	Fine Sand,	·837	·350
	Clay,	7·143	9·524
	Organic Matter,	5·274	5·461
		100·000	100·000

SOIL FROM MR BONE, GREENAN, MAYBOLE.

This soil was of a rather heavy texture. It contains, according to the mechanical analysis, a considerable quantity of clay; but it is obvious that the sand must to a large extent consist of argillaceous matter, for the portion soluble in acids is very large. The next important peculiarity in composition is the unusually large proportion of magnesia it contains.

Soluble in Hydrochloric Acid.

	Soil.	Subsoil.
Silica,	·132	·184
Peroxide of Iron,	3·028	6·930
Alumina,	10·832	8·890
Lime,	·716	1·795
Magnesia,	2·523	3·476
Potash,	·284	·112
Soda,	·312	·129
Sulphuric Acid,	·082	·034
Phosphoric Acid,	·051	·000
Carbonic Acid'	·300	·040
Chlorine,	·029	·101
Total soluble in Hydrochloric Acid,	18·289	21·691

Insoluble in Hydrochloric Acid.

Silica,	56·069	56·592
Peroxide of Iron,	·778	·343
Alumina,	9·408	4·926
Lime,	·341	·383
Magnesia,	·314	·090
Alkalies and Loss,	·181	·355
Total insoluble in Hydrochloric Acid,	67·091	62·689
Water,	4·120	4·320
Organic Matter,	10·500	11·300
	100·000	100·000
Nitrogen,	·235	4·527
Equal to Ammonia,	·286	7·400
Hygrometric Water,	7·320	·182

Mechanical Analysis.

Gravel,		4·041	9·29
Soil,	Coarse Sand,	66·484	74·11
	Fine Sand,	2·485	2·06
	Clay,	16·482	9·42
	Organic Matter,	10·508	5·12
		100·000	100·000

I shall not attempt on the present occasion to enter into any lengthened discussion of the results of these analyses. The remarks which I made on the soils of the previous year, in the last number of the Transactions, apply with equal force to the present analyses. It is obvious that the amount of produce is not always in accordance with the chemical composition of the soil, but that it must depend in some cases to a great extent on its mechanical texture, or on the state of combination in which the elements exist in the soil. Very remarkable in this respect is the comparison between Mr Mustard and Mr Nicoll's soil. Judging from the analyses alone, the former would be pronounced the better soil of the two, and I think this is the conclusion at which a practical farmer would arrive, from the mere examination of the soil. Certainly the chemist would prefer a soil con-

taining 0·37 of potash, and 0·051 of phosphoric acid, like Mr Mustard's, to one containing a trace of phosphoric acid and 0·165 of potash, like Mr Nicoll's; and yet the unmanured soil in the latter case yields 8 tons 9 cwt. of crop, and the former only 1 ton 6 cwt. The natural capability of Mr Nicoll's soil, notwithstanding the comparatively small quantity of these two matters, is the larger. But when they are manured, this difference disappears, for on the naturally poorer soils manures produce by far the largest effect. A mixture of superphosphate and sulphate of ammonia raises the produce of Mr Mustard's soil from 1 ton 6 cwt. to 13 tons 8½ cwt., or by 12 tons 2½ cwt., while exactly the same application brings Mr Nicoll's up from 8 tons 9 cwt. to 13 tons 14 cwt., giving an increase of only 5 tons 5 cwt., or less than half of the former. Such facts are most instructive to the agricultural experimenter, for they teach him to be cautious, and prevent his drawing conclusions from too limited a series of experiments. Indeed, there is no conclusion that forces itself more strongly on his mind than the necessity of gathering together a very large number of experiments before he attempts to draw conclusions from them at all. Unfortunately, the opposite course is that too often adopted. A single experimenter makes some experiments, and from their results he considers himself entitled to draw conclusions applicable to all possible conditions, an inference which the facts by no means justify. Uncalculable injury has been caused in this way to the progress of scientific agriculture, and until experiments are sufficiently multiplied, no good results can be obtained. The experimenter, in place of rushing to conclusions, must endeavour to exercise a degree of patience which is often very trying. It is this course which we are endeavouring to pursue in regard to our field experiments, and to avoid drawing conclusions which the results of another season may upset. Not adhering to this is the cause of the numerous conflicting results which are found in the records of experimental agriculture, results which might have been reconciled, had similar experiments been continued sufficiently long to eliminate differences which might thus have been easily explained, but which, from the absence of this precaution, are now hopelessly irreconcilable.

Field Experiments of 1868.

It was intended to have published now the field experiments of 1868, but the late period at which some of the results have been obtained from the experimenters, has made it entirely impossible to do justice to them without delaying the publication of the Transactions. This course, however, having been considered inadvisable, I am reluctantly compelled to postpone them for the present.

APPENDIX (B).

PROCEEDINGS AT GENERAL MEETINGS.

SPECIAL GENERAL MEETING, 13TH MAY 1868.

SIR THOMAS BUCHAN HEPBURN, Bart., in the Chair.

This meeting was held to vote an address to Her Majesty the Queen on the providential escape of His Royal Highness the Duke of Edinburgh from the recent attempt on his life, and also to congratulate His Royal Highness on his merciful preservation.

The CHAIRMAN, before proceeding to the special business of the meeting, stated that owing to the Duke of Buccleuch, the President of the Society, being on the continent, it was impossible for his Grace to take the chair on this occasion. He also mentioned that letters of apology had been received from a large number of noblemen and gentlemen who were unable, from previous engagements, to be present.

Viscount MELVILLE read and moved the adoption of the following Addresses :—

"*To the Queen's Most Excellent Majesty.*

"Most Gracious Sovereign,—

"We your Majesty's most devoted and loyal subjects, the Highland and Agricultural Society of Scotland, incorporated by royal charter, in special general meeting assembled, deeply impressed with feelings of ardent attachment to the sacred person of your most gracious Majesty, and in all our national warmth of loyalty, beg respectfully to approach the throne with an expression of the abhorrence which we, in common with all classes of your Majesty's subjects, feel for the atrocious attempt which has been recently made on the life of His Royal Highness the Duke of Edinburgh.

"We deeply sympathise with your Majesty and the Royal Family in the distress this murderous assault must have occasioned, and we humbly beg leave to offer to your Majesty our heartfelt congratulations on the merciful interposition which has preserved the life of your beloved son, who, by his manly and generous conduct on all occasions, has so endeared himself to his country.

"We thank Almighty God that He has been pleased to spare the life of His Royal Highness, and we earnestly pray that he may be speedily restored to his wonted health.

"Sealed with the corporate seal, and signed at the desire and in presence of a Special General Meeting of the Society, by Sir Thomas Buchan Hepburn of Smeaton, Bart., Senior Director present, Chairman, in the absence of his Grace Walter Duke of Buccleuch and Queensberry, K.G., President of the Society.

"Society's Hall, Edinburgh, 13th May 1868."

"*To His Royal Highness the Duke of Edinburgh.*

"May it please your Royal Highness,—

"We, the Highland and Agricultural Society of Scotland, assembled in special general meeting, beg most respectfully to offer to your Royal Highness our sincere congratulations on the providential escape from the danger to which your life has been recently exposed.

"Your Royal Highness being connected with Scotland by many ties, we desire to express our most devoted feelings of national indignation on the infamous attempt upon your life, and to express our heartfelt gratitude at the merciful interposition of Almighty God in preserving you from the hands of an assassin.

"It is our sincere hope that it may please Divine Providence to restore your Royal Highness speedily to the full enjoyment of health and strength; and we earnestly pray that your life may be long preserved as a blessing to your Royal mother and to your country.

"Sealed with the corporate seal, and signed at the desire and in presence of a Special General Meeting of the Society, by Sir Thomas Buchan Hepburn of Smeaton, Bart., Senior Director present, Chairman, in the absence of his Grace Walter Duke of Buccleuch and Queensberry, K.G., President of the Society.

"Society's Hall, Edinburgh, 13th May 1868."

Lord Melville, in proposing the adoption of the addresses, referred to the sympathy felt by all classes with Her Majesty, and said he could not understand why a Prince so popular and so justly beloved had been made the object of such an attack. Whatever grievances, he said, the Fenians might be supposed to have had, that was not the way to have them redressed. The attempt had also been made at a time when the people were congratulating themselves upon the success of their efforts to give a loyal reception to His Royal Highness, who was in the execution of his duty. His Lordship, after referring to the stay of His Royal Highness in Edinburgh, expressed a hope that he would soon arrive in England, restored to his wonted health.

Mr Lawson of Borthwick Hall—I rise to second the motions which your Lordship has so feelingly put to this meeting. No words of mine can add to the universally spread thankfulness that our Royal Duke has been spared to us and to a country which so sincerely esteems and beloves him. I am sure also that I may say, on behalf of this Society, that we appreciate the value of such ties the more when we see the possibility of losing them, and that we accept his Royal Highness's escape from a fatality too dreadful to think of, not as an accidental, but as a providential interposition, highly calculated to cement more strongly than ever the bond of attachment which exists between us and the person and family of our Sovereign.

The addresses were unanimously adopted.

Mr Irvine of Drum moved that the addresses be transmitted to the Duke of Montrose for presentation; which was seconded by Sir James Gardiner Baird, Bart., and unanimously agreed to.

Lord Melville proposed a vote of thanks to the Chairman, and the proceedngs terminated.

GENERAL MEETING, 24th JUNE 1868.

His Grace the Duke of Buccleuch and Queensberry, K.G., President of the Society, in the Chair.

New Members.—The noble Chairman, in opening the proceedings, said—The first business that comes before the meeting to-day is the election of new members. I see there is a very large number, which the Secretary will read.

Mr F. N. Menzies then read the names of 104 candidates, who were balloted for and duly admitted.

Reply to the Address to the Queen.—The noble Chairman said he had now to report to the meeting that an answer had been received to the address from this Society to the Queen on the occasion of the atrocious attempt on the life of the Duke of Edinburgh. The Duke of Montrose was still in charge of the address to the Duke of Edinburgh until he had an opportunity of presenting it to His Royal Highness on his arrival in this country.

Chair of Agriculture.—Mr Walker of Bowland said it would be in the recollection of the members of the Society that at the last general meeting of the Society it was agreed to give a sum of L.150 for ten years towards the endowment of the Chair of Agriculture in the University of Edinburgh, or rather to assist in providing a salary for the Professor of that Chair. The grant was given on condition that Government should contribute an equal or greater sum for that purpose. He had now to report that the Directors made the necessary application to

the Government, and that he had the satisfaction to state that a reply had been received to the effect that the Lords Commissioners of the Treasury were pleased to place on the estimates of 1868 the sum of L.150 for that purpose. He had also to state that the University had fulfilled their pledge in order to make the Chair more useful than it had hitherto been, by instituting degrees in agriculture, the examination in which is to be conducted by the University examiners in conjunction with an examiner appointed by the Society.

The noble CHAIRMAN said it was very satisfactory to learn the result of the application to Government in this matter. The University had done well in raising the position of the chair, and he had no doubt that it would be followed by a good practical result.

The report was adopted.

THE ABERDEEN SHOW.—Mr F. N. MENZIES, the Secretary, said—In the unavoidable absence of Mr Kinloch, yr. of Gilmerton, Chairman of the Committee on General Shows, I have to report that the arrangements for the Show at Aberdeen, on the 28th, 29th, and 30th July, are in a satisfactory state of advancement, and that there is every promise of a most successful meeting. Nearly 1200 head of stock have been entered for competition, besides upwards of 460 head of poultry, and a very large number of implements, as well as general collections of seeds and roots, and coniferæ, and other forest trees. The Directors have on this, as on all former occasions, received the cordial co-operation and liberal assistance of the Lord Provost and Magistrates of Aberdeen. A subscription of L.75 has been voted by the Town Council towards the Premium Fund in addition to a free grant of the use of a portion of the Links for a show-yard. The counties embraced in the district of the show have subscribed as follows:—Aberdeen, L.490; Banff, L.120; Kincardine, L.161; eastern division of Forfarshire, L.219. The Royal Northern Society have promised L.100; and the Spey, Avon, and Fiddochside Farming Association have contributed L.12, 12s. The Waterworks Committee have kindly agreed to give the requisite supply of water for the yard free, only making a small charge for the use of the pipes already laid into the Links, to which the Society's pipes will be joined. All the contracts have as yet been undertaken by parties resident in the district, except that for the erection of the show-yard, which the Directors resolved in May last to take into their own hands, owing to the lowest estimate received from Aberdeen having greatly exceeded what the Society has been accustomed to pay at other places. At a meeting held at Aberdeen on the 12th inst., committees were appointed for the various departments. One was named on accommodation for strangers. Such a committee was found of the greatest use at Kelso, Stirling, and Inverness; and I am glad to say that at Aberdeen it will be under the efficient charge of Mr John Angus, Mr George Reid, and Mr Alexander Yeats, secretary of the Royal Northern Society, who has obligingly consented to act as convener. For the admission of the stock and of the public, Major Farquharson of Haughton, and Sir William Forbes of Craigievar, have respectively been named conveners. His Grace the Duke of Buccleuch acts as chairman of the Appeal Committee. The Lord Provost has signified his willingness to preside over the Committee on Police. Mr Anthony Cruickshank, Mr Campbell, Blairton; Mr Campbell, Kinellar; and Mr Walker, Portlethen, were nominated for the Forage Yard. With reference to this department, I may report that two gentlemen, one of them not an exhibitor at Glasgow, brought forward charges against the Forage Committee there of having supplied very inferior stuff at exorbitant prices. I consider it very unfair that such charges should be made at Aberdeen at this period, and not at Glasgow while the show was going on, when I could have shown the Directors the quality of the forage supplied. I may now state, that I have seen Mr Young, Fulford, the chairman of the Forage Committee, who is ready to declare that the contractors acted in the most liberal way, and that not one atom of bad forage of any kind was supplied. I have also a letter from a well-known exhibitor from Dumbartonshire, who says with reference to the charges made at Aberdeen:—"I was surprised to see that the Aberdonians were complaining of the forage at the Glasgow Show. I found whatever I bought as good and as reasonable as I could have got in any retail shop in the city. I had almost a mind to write to the newspapers a letter to that effect." Colonel Gordon of Fyvie has been named convener for the committee in charge of the ball; and Major Innes of Learney for the public banquet. In regard to the last matter, I may men-

tion that a very large committee has been appointed to consider the whole subject. This committee has power to appoint a secretary, and will hold its first meeting at Aberdeen on Friday next. Particulars as to the price of the ticket and place of meeting will afterwards be made known by advertisement. Two attending members on each set of judges were suggested at the recent meeting at Aberdeen, and having to-day received the formal authority of the Directors, I shall immediately acquaint the gentlemen referred to that their nomination has been confirmed. Tickets for admission to the yard have been sent to all members resident in the district; and I have particularly to remind members residing in other localities who may intend being present that they must make application at the Society's office in Edinburgh for tickets not later than Saturday the 18th July. The Society is receiving, as formerly, great aid from Messrs John & Robert Ligertwood, the local secretaries at Aberdeen. I do not think that I need trouble the meeting with further details. The days and hours of admission have been already for some time published; and the usual programme will in due time be advertised.

Agricultural Education.—Professor Balfour reported that at a meeting of the Council on Education, held on the 18th March, the Society's Diploma in Agriculture had been conferred on Mr Thomas John Elliot, Wilton, Salisbury; and the certificate on Mr James Taylor, Allan Vale, Pitmuxton, Aberdeenshire. He also stated that the prizes of L.6 and L.4, annually allowed by the Society to the students in the Agricultural class in the Edinburgh University who pass the best and second best examination, had this year been awarded to—1st, G. R. Glendinning, Mid-Lothian; 2d, G. G. Bursby, Northumberland. The Professor concluded by reporting that at the recent examinations by the Royal Agricultural Society of England the principal prizes were gained by students in the class of Agriculture in the Edinburgh University, and that every one of the Edinburgh agricultural candidates took a first prize. There were twelve candidates, of whom six obtained prizes; and out of the six prize men four were Edinburgh men, three of them having already obtained the diplomas of the Highland Society.

The Duke of Buccleuch said that the report was a very satisfactory one.

The report was approved of.

Veterinary College—Report of Examinations.—Mr Campbell Swinton, of Kimmerghame, in the absence of Mr Gillon of Wallhouse, given in the following report of examinations of the Veterinary College:—"The examination of the students for the Society's Veterinary Diploma took place on the 15th and 16th April, and were conducted by four separate boards. Thirty-two students presented themselves, and, after a careful and searching examination, the Society's diploma or certificate was conferred on the following twenty-nine:—John Whitewright, Corstorphine; Alexander Macray, Aberdeenshire; Henry G. Robinson, Greenock; James Shearer, Ulbster; James Wilson, Kirkconnell; John Grant, Fyvie; James Cairns, East Wemyss; Michael Hartigan, Limerick; James Dobbyn, Waterford; Jonathan Midgley, Yorkshire: Joseph L. Faulkner, Wetherby; George Lawson, Aberdeenshire; George Paterson, Wooler; George Aitken, Dalkeith; Charles B. Bostock, Broadbothan, Manchester; James Clark, Hawick; William Temple, Chester-le-Street; John Cameron, Kineardineshire; Robert Murdoch, Cupar Fife; James Taylor, Aberdeen; John B. M'Gregor, Crieff; James A. Going, Mullenahone; Frederick W. Going, Mullenahone; Alexander Gibson, Aberdeen; George Fowler, Aberdeen; Robert Kerr, Dalry, Ayr; Darby O'Gorman, Ballonaclogh; Jonathan Bunnell, Liverpool; John Shives, St Johns, New Brunswick. Six silver medals were awarded by the Society for the best examination, as follows:—1. Anatomy—Andrew Spreull, Milngavie; 2. Chemistry—Frederick W. Going, Mullenahone; 3. Horse Pathology—Jonathan Bunnell, Liverpool; 4. Materia Medica—Joseph L. Faulkner, Wetherby; 5. Physiology—Andrew Spreull, Milngavie; 6. Best General Examination—George Lawson, Aberdeenshire."

The report was approved of.

Veterinary Charter for Scotland.—Mr Campbell Swinton said he had to report upon another matter connected with veterinary science, in regard to which he was sorry to say that they had hitherto met with ill success—he referred to the effort which had been made to obtain a charter for a General Royal Veterinary College in Scotland. The members were aware that, in conjunction with the Lord Provost and Magistrates of Edinburgh, acting as trustees of the Dick

College, and also acting in conjunction with other public bodies in that city and elsewhere, and with a large number of the veterinary surgeons in Scotland, they had made an application to Government asking them to institute a Royal Veterinary College, not connected specially with Edinburgh, but to hold the same position which the Veterinary College in England did, and to give diplomas, degrees, and certificates to students attending any veterinary establishment where suitable education was given. He was sorry to say that hitherto their efforts had not been attended with success. The last letter which had been received from the Board of Trade on the subject, which was addressed to their London agent, was dated 15th May, and was as follows :—

"Council Office, May 15, 1868.

"Sir,—I am directed by the Lords of the Council to inform you that their Lordships have had under their consideration the petition lodged by you at this office on behalf of the Highland and Agricultural Society of Scotland, and of the trustees of the late Professor Dick, praying for the grant of a charter of incorporation to the Royal Veterinary College of Scotland, and I am to state that their Lordships, after mature deliberation, find themselves unable to recommend Her Majesty to grant the charter prayed for.—I am, &c.

(Signed) "Arthur Helps."

John Graham, Esq., 3 Westminster Street.

That answer evidently proceeded on a misapprehension, because it refused a prayer for a charter of incorporation to the Royal Veterinary College in Scotland, while there was no such body in Scotland. They seemed to be confounding the College, the establishment of which they asked for, with the school of veterinary medicine which existed in Edinburgh. He hoped, therefore, they might still hold out some expectation that when that mistake was properly explained their just demands in that matter for Scotland would receive greater consideration from the authorities in England than they had hitherto met with. Probably the Society would be willing to remit the matter to the Directors, knowing as they did what zealous friends they had in their noble President and in members of both Houses of Parliament, who were anxious still to take that matter up and press it on the attention of the Government.

The Duke of Buccleuch said that the letter which had just been read by Mr Swinton showed that there must be some misapprehension of the object of the Society in asking for this charter. No reason had been assigned for the refusal, and he thought they had therefore a very good right to press the matter still further, and ascertain really what was the objection to granting a charter to a Veterinary College in Scotland. He knew, from what he heard last year, that there was an excessive amount of jealousy in certain quarters against the establishment of a Veterinary College in Scotland. They had an idea that a Veterinary College in England was the only one that ought to be supported, and that every person must go to London to get his diploma. He would like to know how they would have been if there had been no Royal College of Surgeons or Physicians in Scotland. He was not one who felt at all inclined to yield to pressure of that sort ; and when he went to London he would make it his duty to endeavour to ascertain the grounds upon which this refusal was based, and, if possible, to procure the publication of any documents upon the subject, by moving for all the correspondence which had taken place between the Board of Trade and that Society, and all other public bodies upon the subject. He thought they should still press it strongly upon the attention of the Board of Trade.

The matter was remitted to the Directors to take steps for bringing the matter anew before the consideration of the Board of Trade.

Transactions.—Mr Irvine of Drum laid on the table No. III. of the Fourth Series of the *Transactions*.

Premiums.—Mr Irvine of Drum then read the list of premiums awarded for reports.

Chemical Department.—Dr Anderson reported that the laboratory work had been very arduous during the last half-year. The number of analyses had very materially exceeded that of any previous half-year, and the results which had been obtained from them were in many respects extremely important to the agriculturist. This year the number of inferior manures in the market was very considerable, and these were very often sold under names to which they were not

entitled. In some instances, manure said to consist of dissolved bones was almost entirely formed of coprolites and other mineral matters, and in many cases these manures were sold at prices nearly double their intrinsic value. He had also had occasion to examine a very large number of oil-cakes, and here adulteration was carried on to an extraordinary extent. Although it was a mere guess on his part, he would say that there were thousands of tons of oil-cake sold in Scotland during the past six months mixed with bran, cotton-seed, and other substances. In one case the adulteration went so far that he might almost say that the justification for the name of "linseed cake" lay only in this, that a little of that material had been put among the other substances. These adulterations were done so artistically that they deceived the eye, and the article appeared to be the genuine oil-cake, so that, unless care was taken, the adulterations might escape notice. The whole of the field experiments had been arranged for this season. Certain of the experiments of last year were to be repeated, while a series of other experiments on a large scale had been commenced. The manures were to be of the kinds most commonly used, such as farm-yard manure, Peruvian guano, and so forth. He thought that the result of these experiments would be of great importance to the farmer.

Mr Harvey, Whittingham Mains, said he still thought, as he thought a few years ago, that there should be a chemical department in Edinburgh. Glasgow was renowned for commerce, but not for agriculture. The eastern part of Scotland had by far a greater interest in agriculture than the west; and he thought that the present arrangement was very inconvenient for the farmers in this district. With regard to the adulterations mentioned by Dr Anderson, he wished to know whether something could not be done to check such a system, by advertising the firms who sold adulterated material. He knew there was a difficulty in regard to pouncing upon firms selling adulterated manure, but it was a system by which the farmers suffered very greatly, and it ought to be inquired into. He thought that the chemical department of the Society was not in that satisfactory position that the farmers of Scotland were entitled to expect. He was of opinion that they ought to have a model farm connected with the Society, as there was nothing like seeing practical work. He had no great faith in farmers carrying out these experiments, as they were often transferred to a substitute. He would mention a case in point. Two most respectable farmers in the county of Roxburgh on a recent occasion undertook the experiments, and what was the result? A drain had burst in both experiments, and no practical result was arrived at. A model farm, in his opinion, came nearer the mark, as in that case a person would be appointed of undoubted integrity to see that every pound and ounce of the produce raised would be weighed thoroughly out, and a greater power and a greater force would be connected with these experiments. He was aware that there was some difficulty with an experimental farm—it would cost money—at the same time, to gain the confidence of the farmers of Scotland perhaps it would be the best plan that could be devised.

Dr Anderson said that it was true, as Mr Harvey had stated, that the greater part of the analyses came from the eastern districts of Scotland. He very much feared that in some parts of the west agriculture was not so much advanced as to induce the farmers to take advantage of what the railways could do. The best mode of putting a stop to adulteration was a question of very great difficulty. He feared that it would be rather a dangerous proceeding to venture upon advertising the names of adulterating dealers; at least, if such a thing were done, he certainly hoped the Society would take any responsibility in the matter off his shoulders. As far as model farms were concerned, there was no doubt that a great deal of important information could be got from such farms if they could be got up. The difficulty in that matter was chiefly a pecuniary one. A model farm could not be carried on at a profit; it had been invariably found that such a farm must be carried on at a loss, and the whole question would be how to obtain the pecuniary means to carry on such a farm, which would certainly not be small, when it was taken into account that the researches of Mr Lawes cost him L.2000 a-year. These were experiments, no doubt, on an extensive scale; but that gave some idea of the cost of these experiments, and Mr Lawes certainly carried on his experiments in a very economical manner.

Mr Milne Home said that, in regard to the suggestion of a model farm, that matter was brought before the Directors at one time by the late Mr Finnie of

Swanston, and a part of Linlithgowshire was suggested as a place where a model farm could be obtained. At that time Professor Low was in the Chair of Agriculture, and gave his assistance to the Directors in considering the matter; and the result of the deliberations of the Directors was, that a very large sum would be required to pay the rent and expenses of a model farm, because it would be conducted upon principles totally different from those upon which ordinary farms were carried on, and because, while farmers only grew those crops which had been ascertained to yield a profit, the object of a model farm would be to try unknown experiments, which, in nine cases out of ten, would result in failure and a large expenditure. Unless, therefore, the Society was prepared to set apart a considerable sum, the idea of starting a model farm was Utopian; but he did not see why the well-managed farms in East Lothian might not afford the same facilities for field experiments which a model farm could afford. If some of those gentlemen so intelligent in agriculture were to allow a small portion of their land to be used for well-conducted experiments, the same results might be secured as by a model farm at far less expense. Considering the great importance of agriculture in the east of Scotland, he thought there ought to be some establishment connected with chemistry in Edinburgh as well as in Glasgow, and perhaps Professor Anderson and the Directors might be able to make some arrangements to meet the views of Mr Harvey in that matter. Considering the importance of East Lothian, he thought there ought to be some chemical establishment nearer them than in Glasgow.

Dr Anderson said that Mr Milne-Home's suggestion in regard to certain farmers setting aside part of their land and making experiments was being carried on. The field experiments were being carried on by some of the most distinguished agriculturists, and they were carried on on a very admirable footing. The gentlemen have been selected as those experienced in such matters. With regard to Mr Harvey's remarks as to the chemical department, he (Dr Anderson) made a proposal at the time he went to Glasgow that a certain part of the work of the Highland Society should be done in Edinburgh, but the Directors thought it was entirely unnecessary, and that the work would be better consolidated in one place.

The Chairman said he had no doubt that the remarks made on this subject would be considered by the Directors, in case it might be thought necessary to make arrangements to meet the wishes of persons in this part of the country. As to the proposal to have a model farm, his idea was that, for such a thing to be of real utility, they would require not one model farm, but half-a-dozen. He thought that the experiments were not so necessary on fine, rich, deep loam and soil, but they ought rather to be made on clay and cold lands, and where there was a bad climate. It was on farms situated on such districts that, in his opinion, they required to make the experiments. It was not always the best land that was the best to make experiments upon. He saw the peculiar difficulties of having a model farm. After one was erected, there might be a proposal to establish others in different parts of the country, which would cause great expense to the Society. Most of the proprietors of Scotland had got farms of their own which they did not always find to be very profitable, and he would suggest that it would only be a little additional loss if they were to make a few such experiments as were desired.

Mr Harvey said his idea was that they should have a model farm in a central part of the country. He did not like the experiments of farmers themselves, as they were often very carelessly conducted. They had spent a great deal of money on the chemical department, and he did not think it had been worth ten straws to them. With a model farm they would have ocular demonstration of what might be accomplished. Mr Harvey further stated that he never for a moment thought of proposing that a model farm should be established about Dunbar, or within three or four miles of Edinburgh, where abundance of manure could be supplied, but in a central district of Scotland—perhaps in some district between the eastern and western oceans, and land not naturally in a high condition, where all manure supplied shows itself more minutely; then there would be something like data to work upon. These were his opinions, and he was fortified in them by present and ex-Directors of the Society.

The subject then dropped; and a vote of thanks having been given to the Duke of Buccleuch for presiding, the meeting separated.

GENERAL MEETING, 20th JANUARY 1869.

His Grace the Duke of Buccleuch and Queensberry, K.G., President of the Society, in the Chair.

Election of Office-Bearers.

The Duke of Buccleuch said—The first business is to call upon the Secretary to read the list of office-bearers whom the Directors recommend to the Society to be elected. Great trouble and anxiety have been taken in the selection of the gentlemen whose names are in the list, and I trust it will be such as to meet with the approval of the Society.

Mr F. N. Menzies then read the list of office-bearers proposed to be elected, as follows :—

President—Most Noble the Marquis of Tweeddale, K.T.

Vice-Presidents—Right Hon. Earl of Southesk ; Right Hon. the Earl of Kintore ; Right Hon. the Earl of Dalkeith ; Right Hon. R. C. Nisbet Hamilton.

Extraordinary Directors—Sir James Horn Burnett, Bart. ; Sir Alexander Bannerman, Bart. ; John Gordon of Cluny ; Lieutenant-Colonel William M'Inroy of The Burn ; Alexander Morison of Bognie ; Sir William Baillie, Bart. ; Sir Alexander C. R. Gibson-Maitland, Bart., M.P. ; Robert Dundas of Arniston ; Peter M'Lagan of Pumpherston, M.P. ; John Stirling of Kippendavie.

Ordinary Directors—Archibald Campbell Swinton of Kimmerghame ; William Stuart Walker of Bowland ; Sir Thomas Buchan Hepburn, Bart. ; William Wallace Hozier, yr. of Mauldslie ; Colonel William Mure of Caldwell ; Thomas Park, Stoneyhill ; Walter Reid, Drem ; Graham Somerville of Sorn ; Graham Binny, W.S., Edinburgh ; Colonel Archibald Campbell of Blythswood ; Colonel Joseph Dundas of Carronhall ; Robert Elliot, Laighwood ; James Geddes, Orbliston ; John Ord of Muirhouselaw ; Major John Ramsay of Barra ; Robert Russell, Pilmuir ; Sir James Gardiner Baird, Bart. ; Hew Crichton, S.S.C., Edinburgh ; Charles Lawson of Borthwick Hall ; Alexander M'Dougal, Granton Mains ; Thomas Mylne, Niddry Mains ; Thomas Coutts Trotter, Bilston Lodge ; John Wilson, Edington Mains ; Sir George Warrender of Lochend, Bart. ; Robert Binnie, Seton Mains ; John Dickson, Saughton Mains ; Thomas A. Hog of Newliston ; James E. Newton, Linnbank House ; John Wilson, Professor of Agriculture, University of Edinburgh ; Alexander Young, Keir Mains.

Office-Bearers—The Right Hon. Sir William Gibson-Craig of Riccarton, Bart., treasurer ; Sir William Stirling-Maxwell of Keir, Bart., Honorary Secretary ; Fletcher Norton Menzies, Secretary ; Rev. James Grant, D.C.L., D.D., Chaplain ; Thomas Anderson, M.D., Professor of Chemistry in the University of Glasgow, Chemist ; Kenneth Mackenzie, C.A., Auditor ; John Wilson, Professor of Agriculture, University of Edinburgh, Professor of Agriculture ; W. J. Macquorn Rankine, LL.D., Professor of Civil Engineering, University of Glasgow, Consulting Engineer ; Alexander Slight, Practical Engineer ; Gourlay Steell, R.S.A., Animal Portrait Painter ; William Williams, Professor of Veterinary Surgery ; Thomas Duncan, Clerk ; John MacDiarmid, Junior Clerk ; William Blackwood & Sons, Publishers ; Neill & Company, Printers ; Mackay, Cunningham, & Company, Silversmiths : Alexander Kirkwood & Son, Medalists ; John Watherston & Sons, Inspectors of Works ; John M'Neill, Messenger.

Chairmen of Standing Committees—Argyll Naval Fund—Admiral Sir William J. Hope Johnstone, K.C.B. *Chemistry*—Professor Anderson. *Cottages*—Harry Maxwell Inglis of Logan Bank. *District Shows*—A. Campbell Swinton of Kimmerghame. *Finance*—Anthony Murray of Dollerie. *General Shows*—Alexander Kinloch, yr. of Gilmerton. *House and Buildings*—John Ord Mackenzie of Dolphinton. *Machinery.*—John Gibson, Woolmet. *Premiums for Reports on the Science and Practice of Agriculture*—Patrick Dudgeon of Cargen. *Premiums for Reports on Woods and Plantations*—Professor Balfour. *Publications*—Alexander Forbes Irvine of Drum. *Veterinary Department*—Andrew Gillon of Wallhouse.

The Duke of Buccleuch then said—I have now to propose that those gentlemen whose names have been read to you be the office-bearers of the Society. I have particular pleasure in recommending to your notice specially the nobleman who is proposed to succeed me in the office of President of the Society. He is one of the oldest members of this Society—one who has taken the deepest interest in

it—one who, not only from his theoretical but practical knowledge of all those subjects with which this Society is most connected, will bring great weight to bear in the Society; and he will be not only an ornament, but a great benefit to the Society, if you will be pleased to elect him. There is no one better known in this district, and generally in Scotland, both as a landlord and as a real practical agriculturist, than Lord Tweeddale. It is a great satisfaction to myself that I have now the honour of proposing him to you. I have long been anxious to see him holding the highest office in the Society; and that wish will now be gratified if you elect him, and in doing that honour to him, you will be conferring a great honour on the Society. I now propose to the meeting that the Marquis of Tweeddale be elected President of the Society for the ensuing year. I have also to propose that those gentlemen whose names have been read to you be elected Vice-Presidents, Ordinary Directors, and Extraordinary Directors, in lieu of those who have gone out. I may state in regard to one of those gentlemen, who does not go out by rotation—Mr Forbes Irvine of Drum—that he has voluntarily resigned the office he holds as an Extraordinary Director, to relieve the Directors of any feeling of difficulty in arranging the list that is now submitted to you. I may also intimate that Professor Lyon Playfair, M.P., has resigned the office of Chairman of the Standing Committee on Premiums for Essays and Reports, and that the Directors propose that Mr Dudgeon of Cargen should be appointed chairman in room of Professor Lyon Playfair. Is it the pleasure of the meeting to agree to these nominations? (Applause). I have now the honour to move that the Marquis of Tweeddale take the chair.

The Duke of Buccleuch then retired from the chair, which was taken amidst applause by the Marquis of Tweeddale.

The Marquis of TWEEDDALE—I cannot express to you how sensible I am of the honour that has been conferred upon me in being elected President of the Highland Society of Scotland. I feel very much indebted to the noble Duke for the kind manner in which he has introduced my name to this meeting. Although my noble friend has resigned the high position which he held in this Society, I trust that he will yet give us his advice on the further development of the land in Scotland—which he is so well able to do from his long and practical experience in the successful management of very large estates. I beg to assure the members of the Highland Society that I shall have the greatest pleasure in placing all the experience and knowledge which I have obtained in agricultural matters in the course of a long life at their service. I feel sure that you will not expect me to make a long speech before you have had some proof that I am doing what I promise to you. Accept my thanks for the honour you have done me.

VOTE OF THANKS TO THE DUKE OF BUCCLEUCH.—Sir W. GIBSON-CRAIG—I have been requested to move what I cannot doubt will be most acceptable to the Society—a vote of thanks to his Grace the Duke of Buccleuch for the services he has rendered to the Society while he has been President. The Duke is so well known that I am quite sure I need not dilate to this Society either upon the qualifications or the merits of the noble Duke. I believe that there is no man in the kingdom, with the exception of our present Chairman, who has done so much for the agriculture of Scotland as the Duke of Buccleuch has done; and in one respect I may say that the Duke holds a place superior to the noble Marquis, and, I believe, to any one in the country; because I believe that no estate has been so thoroughly improved as that of the Duke of Buccleuch, and certainly there is no estate in which such enormous sums have been spent for the improvement of agriculture. With regard to the noble Duke's conduct since he has been Chairman of this Society, I have only to remind you of the extreme judgment, good sense, discretion, and kindness with which he has conducted himself upon every occasion, and to every member of the Society, whether in public or in private. And while we deeply regret the loss of the Duke as our President, we are also indebted to him for the honourable and considerate manner in which he has resigned the situation which he has held, in order that another noble Lord might for the first time occupy the position of President of the Society. We recognise in the Marquis of Tweeddale also one of the great benefactors of Scotch agriculture. I therefore, without further preface, beg to move the following resolution:—

"That the Duke of Buccleuch and Queensberry, K.G., having now retired from the office of President, the best thanks of the Society are eminently due to His Grace for the zeal exhibited by him in promoting its welfare and efficiency.

That the special thanks of the Society are also due to His Grace for having accepted office for a second period when a change in the secretaryship was to take place, and when his knowledge of the constitution and regulations of the Society, and his ability and capacity for business, enabled him to render it great service."

Sir WILLIAM STIRLING-MAXWELL seconded the motion. He said—The Duke of Buccleuch is so accustomed to give his services to the Highland Society as a matter of right at any time when they are asked, that we are apt not to be so deeply sensible of the obligation under which we lie to him as we ought to be; but I am sure that if there be any shade of regret at seeing our newly elected President in that chair, it is that we lose the services of the Duke of Buccleuch. If, on the other hand, there is anything to console us for the loss of the services of the Duke of Buccleuch, it is that we have now the power of conferring upon the noble lord who now sits on that chair the greatest honour we can bestow, and to place in our chair one of the most eminent agriculturists of Scotland.

The Duke of BUCCLEUCH—My Lord Tweeddale and gentlemen, I must rise at once to return thanks for the vote which you have accorded to me for my past conduct as President of this Society. If I have been successful in my endeavours to do my duty in that position, your appreciation of that success is the best reward that I can receive. I may say, with regard to what fell from my right honourable friends in regard to myself, and also my noble friend the President, that, if I have been successful in what I have endeavoured to do with regard to the management of my estates, I cannot take very great credit to myself; for, after all, I have only done the duty which devolved upon me. It is a duty, however, in which I have always taken the very greatest interest, and instead of being irksome in any way, it has been always a labour of love to me. Where a person is interested in an object, he feels no fatigue in discharging any duty connected with the promotion of that object. I was perfectly astonished, and I felt a great amount of gratification when it was proposed to me a second time to hold the office of President of this Society—an honour which I believe was never conferred upon any one before. But when I was told that my acceptance of the office would be a benefit to the Society I felt that I was bound to undertake the duties of the office. Whatever assistance I can give to my noble friend the President, or to any of the officers of this Society, or to the Society itself, I shall be as ready to give now when out of office as I was formerly when in office—and in any way that you can command my services I shall always be ready to give them as far as it is in my power. I may state that I am not a little satisfied with some results that have occurred to the Society during the time that I have had the honour to hold the office of President. During these three years, 313 new members have been added to the Society, and there has been an addition of L.4862 made to the vested capital of the Society. The arrears of annual subscriptions, too, which used formerly to be a source of annoyance, have decreased from L.321 to L.84 at the close of last year. The Transactions of the Society have been issued to members on application, and three numbers have been issued. During these three years there have been two General Shows. In 1866, it was intended that a show should have been held in Glasgow; but on account of the grievous plague amongst cattle, it was delayed till 1867, when I was unfortunately prevented by my Parliamentary duties from being present. Last year, there was as good a show as was ever held—at all events in the northern counties—in Aberdeen. That show was most successful; and, judging from the applications made to the Society from other places, I have not the slightest doubt that the same success will attend the future shows of the Society as have attended those that are past. His Grace concluded by again returning thanks for the honour that had been paid to him.

NEW MEMBERS.—Seventy-five noblemen and gentlemen were balloted for in the manner prescribed by the charter and bye-law, and admitted as members.

THE SOCIETY'S ACCOUNTS.—Sir WILLIAM GIBSON-CRAIG laid on the table the accounts of the Society for 1867-68, which have already been published.

Mr LYALL, Old Montrose, said he observed in the accounts a sum of L.500 standing on deposit receipt waiting for investment. He wished to know whether it was the intention of the Directors to invest the L.500 between this and the next general meeting.

Sir WILLIAM GIBSON-CRAIG.—What is your object in putting that question?

Mr LYALL.—My object, Sir William, was to see whether the Society was com-

plying with the rules of the charter. As I read the rule, the Directors shall only invest money subject to the approval of a general meeting.

Mr Murray of Dollerie said that the sum of L.500 was still in hand, and that it was the intention of the Directors to invest the money so soon as they found a suitable investment, which would be submitted to the next general meeting.

Mr Lyall said he observed from the accounts that there had been a sum of L.2479, 16s. invested, and he had not heard that there had been any approval asked at this meeting.

Sir William Gibson-Craig said that the usual course had been followed in this case. It was stated in the accounts that the sum had been invested, and it had been presented to the meeting for approval.

The subject then dropped, and the accounts were agreed to.

Argyll Naval Fund.—Admiral Sir William Hope Johnstone gave in the accounts of the Argyll Naval Fund, which were approved.

The Aberdeen Show, 1868.—Mr Kinloch, yr. of Gilmerton, said that he had to state, for the information of the meeting, that the last general show of the Society, held at Aberdeen in August last, was a successful one, although it would cost them something like L.450. He was much pleased to hear the opinion of the noble Duke, the late President, about it. The exhibition of stock in those classes in which His Grace took part was acknowledged to be first-rate. He regretted that he could not say that the exhibition in all the other classes was equally successful. For instance, the exhibition of thoroughbred horses was a complete and wretched failure. The exhibition of this class of stock at Kelso was bad enough, but at Aberdeen it was ten times worse. He hoped that hereafter the Directors would not allow local pressure to cause them to offer prizes for stock which they themselves did not approve of. The exhibition of Clydesdale horses and Ayrshire cattle was not such as they were accustomed to see at the shows of the Society; but there were special reasons for that in the refusal of the railway companies to make certain concessions in their regulations for the conveyance of stock. He then alluded to the opposition show held in Glasgow by those gentlemen who did not send their stock, owing to the failure to make a suitable arrangement with the railway companies. These gentlemen would have met with the sympathy of the members of the Society; but what did they do? At the last moment they organised an opposition show in Glasgow, to be held on the same day as the Society's show. He could only wish that these exhibitors had heard the remarks that were made in the show-yard at Aberdeen in regard to their conduct. When they read in the newspapers of the following day that the "show on Tuesday in Glasgow was the most successful of the kind that had been held," they knew that the animals so exhibited were the animals that should have been standing in the empty stalls at Aberdeen. He supposed, however, that bygones must be bygones. He was glad to state that, owing to the kind services of Mr Stirling of Kippendavie, he had good hopes that the railway companies would make some concessions previous to the Edinburgh Show. He trusted they would be able to announce that horses and bulls would be carried free on their return journey in horse-boxes, and also that all stock might be conveyed to and from the show in special cattle trains. That, he knew, did not fully meet the demands of the requisitionists in the south-western districts; but he hoped they would give the Directors credit for having gone carefully into the matter. He might say that it was the unanimous opinion of the Directors that it would be unreasonable to ask anything more of the railway companies. In connection with the Show at Aberdeen, he felt bound, on the part of the Directors, to apologise to those gentlemen who were kind enough to act as their judges for the entertainment that was given them. The entertainment was not such as the Society had a right to expect in what was considered to be a first-class hotel. He complained of the public dinner, and said that they could have got in any small market town, at a 3s. 6d. ordinary, such a dinner as was served to them at the contract price of half-a-guinea a-head. The fact was that he and Mr Menzies had so much to do in the show-yard that they could not look after that matter properly, and he hoped that the Directors would arrange that the duty should be discharged by others who would be able to give attention to it, and see that their guests were properly attended to. He begged now to move as follows:—

"1. That the best thanks of the Society be given to Alexander Nicol, Esq., Lord Provost, and to the Magistrates of the city of Aberdeen, for their cordial

co-peration in the arrangements connected with the late show of live-stock and implements at Aberdeen, for the liberal contribution voted by them in aid of the premium fund, and also for the use of the Links for the purposes of the showyard.

"2. That the grateful acknowledgments of the Society are due to his Grace the Duke of Buccleuch and Queensberry, K.G., for the warm interest displayed by his Grace on the occasion of the General Show at Aberdeen, and for the manner in which he, as President, discharged the duties of Chairman at the public banquet.

"3. That the thanks of the Society be tendered to the Right Hon. the Earl of Dalhousie, K.T., senior Vice-President of the Society, for his presence and services at the late General Show at Aberdeen, and for his kindness in acting as Vice-Chairman at the public banquet.

"4. That the thanks of the Society are due to the Commissioners of Supply for the counties of Aberdeen, Banff, Kincardine, and Forfar, for the liberal aid afforded by them on the occasion of the Aberdeen Show.

"5. That the thanks of the Society are due to Alexander Forbes Irvine, Esq., of Drum, Chairman, and to the noblemen and gentlemen of the Looal Committee, for their zealous and valuable services to promote the success of the meeting at Aberdeen.

"6. That the thanks of the Society be given to Sir William Forbes of Craigievar, Bart., for the great personal attention paid by him to his duties as Convener of the Gate Committee at the Aberdeen Show."

The resolutions were unanimously agreed to.

The Edinburgh Show in 1869.—Mr Kinloch, yr. of Gilmerton, stated that that the arrangements for the General Show at Edinburgh this year were in a satisfactory state of advancement. The Premium-list and Regulations were on the table for approval, and the prizes offered amounted to nearly L.1500, irrespective of the value of the medals which might be awarded for extra stock and for the first-prize animals at former shows. The Lord Provost and the Magistrates and Council had consented to allow the Show to be held in the West Meadow Park, the Society agreeing to relieve the city of all loss of rent or otherwise which may be sustained, restoring the ground to a proper state for grazing after the Show, and fencing the trees in such a way as to prevent their being injured. In 1859, the city of Edinburgh contributed L.100 towards the general expenses of the Show that year, and it was expected that the authorities would not be less liberal on the present occasion. The counties connected with the Show—Edinburgh, Haddington, and Linlithgow—had all agreed to a voluntary assessment according to rental. He had only to add further, that the Directors had thought it expedient to fix the days of the Show for Wednesday, Thursday, and Friday, instead of Tuesday, Wednesday, and Thursday. The Show would accordingly take place on the 28th, 29th, and 30th of July.

The Secretary intimated that the Directors had named Mr Dundas of Arniston as Convener of the Committee for the Edinburgh Show.

The Duke of Buccleuch moved a vote of thanks to the Lord Provost, Magistrates, and Council of Edinburgh for giving the use of the Meadows for the Show. He did not suppose that there could have been found anywhere a better site for such a purpose.

Mr John Clapperton said he understood that the inhabitants of the South Side had a decided objection to the Show being held in the Meadows. He believed that the citizens of Edinburgh would meet the Magistrates on the subject, and probably it would not be right in them to be confident that they would get the Meadows. He thought it would be unmanly in him not to sound that note of warning.

Mr Duncan M'Laren, M.P., said that though he was no party to raising any difficulties in this matter, he knew a good deal about the merits of the subject, and he would have the Directors to consider that legal difficulties might prevent the possibility of their having a Show in the Meadows. He had something to do in getting the Act of Parliament passed for having a public park in Edinburgh, to be supported by local rate. The Town Council were then, in 1844, the absolute owners of the Meadows; but at that time, in virtue of the Act of Parliament to which he had referred, the Meadows were leased as a public park to the Commissioners of Police, who were authorised to levy a local rate for maintaining that

park. They had levied that local rate for the last fourteen years, and had spent many thousand pounds upon the park; and his belief was that if any rate-payer thought it worth his while to try the question, any single ratepayer would defy both the Highland Society and the Town Council, and prevent the Cattle Show being held in the Meadows. The very idea of a Cattle Show was that there should be an enclosed park, from which the public should be excluded. He gave this information simply as a matter of courtesy and good feeling, having nothing to do, and intending to have nothing to do, with any meeting that had been or might be held upon this subject.

Sir William Gibson-Craig said that the only interest which the Highland Society had in this matter was, that they should be informed as soon as possible whether they were to have the Meadows or not for their Show. The power of granting the park lay with the Magistrates and Council, and they could not say anything upon that question. He might remark, however, that there was some idea that having the Show in a park tended to improve the grass.

Mr Handyside said that he had the honour of being a Magistrate and a member of the Town Council when it was resolved to grant the Meadows for the Show. They had no difficulty in granting the park; but he must say that the legal objection referred to by Mr M'Laren was not mooted. He did not suppose that any Town Councillor dreamt of it. He hardly thought that any inhabitant of Edinburgh would put himself in what he considered would be the very false position of offering any opposition to the Show being held in the Meadows. He thought it would be doing great injustice to Edinburgh as a city, and to the decision of the Magistrates when they made this grant, if any one acted in that manner. He never heard that there was any feeling of opposition until he heard of Mr Clapperton's remarks. He could see no good ground for complaining of the Show being held in a public park, and he sincerely trusted for the honour of the city that there would be no opposition.

Professor Macquorn Rankine said that perhaps it might be worth while to state that the last two shows, held in Glasgow and Aberdeen, were both held in public parks.

The resolution thanking the Magistrates and Council for the use of the Meadows was unanimously adopted.

The Dumfries Show in 1870.—Mr Kinloch reported, in reference to the Show in 1870, that a requisition had been received from the district of Dumfries—consisting of Dumfriesshire, the Stewartry of Kirkcudbright, and Wigtownshire—asking the Directors to hold the show at Dumfries. That request had been favourably entertained, and he had been instructed to submit the following resolution for the approval of this meeting:—"That this meeting approve of the General Show of the Society being held at Dumfries in 1870, and authorise the Directors to make the necessary arrangements."

The resolution was adopted.

District Shows.—Mr Campbell Swinton of Kimmerghame, reported that during the past year local shows of stock for premiums given by the Society had taken place in fourteen districts, irrespective of the intermediate competitions held for premiums given by district associations, and that a sum of about L.250 had been awarded, besides a number of medals for the same classes of stock. There had also been awarded two medium gold medals for cheese exhibited at the Kilmarnock Show in October last; one hundred and twenty-three silver medals at fifty-four different exhibitions for the best male and best female animals, best fat stock, best managed farms, green crops, best managed dairy and dairy produce, best collection of seeds and roots, &c.; one hundred and sixty-seven medals to the winners of the first prizes at as many ploughing matches; and twenty-one medals, besides sums of money, for the best-kept cottages and cottage gardens in twelve districts. Mr Swinton then stated that the Directors had been for some time engaged in adjusting the lists for 1869, and that it had been arranged, with the approval of the General Meeting, to give the following grants:—Ten districts for cattle at L.25, and a silver medal each; two for stallions, at L.25 each; two for entire colts, at L.10 each; six for sheep, at L.19, and a silver medal each; one for swine, at L.10, and a silver medal; two for dairy produce, at L.10, and two silver medals each; four gold and eight silver medals for dairy produce, to be competed for at Kilmarnock Show in October next; the usual number of medium silver medals to the various districts which have applied for grants, as well as

silver medals at the intermediate show of stock ; and plough medals on the former conditions, as well as the cottage premiums. In regard to the latter, he stated that the Directors had opened a door so as to admit crofters paying L.15 of rent and under to compete for a medal, on condition that individual proprietors or local associations give L.2 in prizes for each medal claimed. He concluded by reporting that it had been resolved upon by the Directors to propose to the General Meeting to vote the sum of L.50 for the year 1869 to the Edinburgh Christmas Club, as being the Metropolitan Fat Stock Show of Scotland.

Mr Pagan, Innergeldie, proposed that the grant to the Edinburgh Christmas Club should be increased from L.50 to L.100. He thought that L.50 was too a small pittance to be given by a great Society like this.

Mr Campbell Swinton said that this matter met with the most attentive and careful consideration on the part of the Directors, and he hoped that the resolution at which they had arrived would be adopted.

The report was unanimously adopted.

Chair of Agriculture.—Mr Lawson of Borthwick Hall, reported that the arrangement agreed to by the General Meeting in January last, in regard to the endowment of the Chair of Agriculture in the Edinburgh University, had been fully carried out. He stated that the agreement was that the sum of L.150 per annum should be given by the Society for ten years, on condition that Government gave an equal or a greater sum ; and that it had been reported at the half-yearly meeting of the Society in June last, that the Lords Commissioners of the Treasury had agreed to include L.150 in the estimates. The vote had since passed, and the first half-year's allowance had now been paid both by Government and by the Society.

The report was approved of.

Veterinary Department.—Mr Gillon of Wallhouse, Convener of the Veterinary Committee, reported that up the present time the attempts to get an independent royal charter for a Veterinary College had failed ; but they did not mean to give up the contest. It would be renewed on the first opportunity. They must have a royal charter for Scotland, and the sooner they could get it the better. Mr Gillon proceeded to report that the Society continued to take a lively interest in all that concerned the welfare of the Veterinary College. On 2d November last he attended the opening of the College, and listened with pleasure to a most excellent address, delivered by Dr Dalzell to the students. He was happy to notice the very numerous attendance, and he could not help remarking that they were a very superior class of young men. The College was now in a very prosperous condition, and he thought it would continue to be so under the able direction of Principal Williams and those who laboured with him.

Chemical Department.—Professor Anderson reported the proceedings connected with the Chemical Department. In the course of his remarks, he said that he had arranged for the experiments for the present season, which were likely to be of a very important kind. They were but on a small scale, but such as would go over the whole rotation. He had been afraid that, owing to the drought, the experiments would have been a failure, but he was glad that they had turned out well up to this time. In regard to the work of the laboratory, he believed that the number of analyses had exceeded that of any previous year. He had been successful in detecting some important cases of adulteration, so that farmers had been able to recover from the sellers a considerable sum of money.

Mr Harvey, Whittingham Mains, said he thought that this subject was connected with the most important department of the Highland Society. It was all the more important, particularly in a year like this when roots had been so very meagre. He had been reading Dr Voelcker's account of the Chemical Department of the English Society, in which that gentleman said that the extent of adulteration had this year been altogether beyond precedent. An instance was given of pigs killed through having been fed on cakes containing such poisonous stuff as castor-oil beans, and the still more poisonous curcus-bean. In more than one case bearing the press stamp "pure," the cake had been adulterated to a very great extent. He thought that the Chemical Department of the Highland Society might be made still more useful by perhaps appointing a committee to take steps to stop, as far as was in their power, that abominable system of adulteration. They, as agriculturists, knew what was good land and what was very bad; but few of them knew what their animals fed upon, or what fertilisers to put into the land. He

wished to bring the matter under the attention of the Directors, so that they might take it into consideration ; and also that possibly it might be connected with the Chair of Agriculture, so that the young farmers might be able to analyse these things for themselves. He made this proposal in sincerity for the use of his brother farmers, well knowing the very large sum that was annually paid for special manures and feeding stuff.

Professor ANDERSON said he would be glad to join in any additional precautions so as to enable the Society better to detect adulteration; but he thought that if the Society took a more active part in the matter, it would be attended with difficulties. It was at one time proposed that the Society should publish the names of the adulterators ; but he was afraid that in many cases it would be an unsafe and unadvisable course for the Society. He did not say that the question of adulteration was in so satisfactory a state as they could wish it to be ; but he thought that there was less adulteration than there was some years ago. He was quite sure that the number of inferior manures in the market was smaller than formerly.

The CHAIRMAN said he was very glad to hear his friend Mr Harvey bring that subject before the meeting. It was, in his opinion, one of the most interesting subjects that could be brought before a farmer, and he believed it was one of the subjects that was least understood in farming. Without entering further into the subject at present, he would direct attention to a work written by Baron Liebig on the subject, and to another published by his friend Mr Stephens and Dr Sellar. He recommended these books for further consideration, particularly to young aspirants looking to be farmers in the future.

The report was approved of.

PREMIUMS FOR REPORTS ON THE SCIENCE AND PRACTICE OF AGRICULTURE.—Professor BALFOUR reported the premiums awarded for reports since the General Meeting in June, and stated the premiums to be offered in 1869.

The report was approved of.

PREMIUMS FOR REPORTS ON WOODS AND PLANTATIONS.—Dr BALFOUR announced the premiums awarded for reports lodged in competition under this department, as well as the subjects proposed for the current year.

The report was approved.

TRANSACTIONS FOR FEBRUARY 1869.—Mr IRVINE of Drum, reported that the next No. of the Transactions, viz., No. 4 of the Fourth Series, would be published in February, and mentioned the reports it would embrace.

The report was approved of.

On the motion of Mr WALKER of Bowland, a vote of thanks was given to the Chairman, which terminated the proceedings.

PROCEEDINGS AT BOARD MEETINGS.

MEETING OF DIRECTORS, 5TH FEBRUARY 1868.

Mr CAMPBELL SWINTON of Kimmerghame in the Chair.

GLASGOW SHOW 1867.—A letter was read from the Lord Provost of Glasgow, returning his thanks for the terms in which is services were noticed at the General Meeting in January 1868.

CHAIR OF AGRICULTURE.—The SECRETARY reported that, in accordance with the resolution of the last General Meeting of the Society, he had made the necessary application to Government in regard to the endowment of the Chair of Agriculture in the University of Edinburgh; that a deputation had afterwards waited on Mr Hunt, M.P., the Financial Secretary of the Treasury, on the subject, and that a letter had since been received from Mr Hunt, stating that the Lords Commissioners of Her Majesty's Treasury will be prepared to place upon the estimates for the ensuing year the sum of £150, for the endowment of the Chair of Agriculture, to meet a like sum to be contributed by the Highland Society, and that should Parliament assent to the grant of the money, their Lordships propose to ask the House of Commons for a similar grant so long as an equivalent sum is contributed by the Society, and so long as the value set by students upon the lectures to be delivered, as evidenced by the attendence at them, shall be such as to justify their Lordships in taking such a course.

VETERINARY CHARTER.—A letter was read from Dr J. G. Fleming, President of the Faculty of Physicians and Surgeons of Glasgow, pointing out that, as the draft charter for a Royal Veterinary College for Scotland at present stands, it is not proposed to have representatives from that corporation as trustees, and trusting that the Directors of the Highland Society would see the propriety of placing the faculty on an equal footing with the Edinburgh medical corporations.

Mr HOZIER, yr. of Mauldslie, supported the application, and the Directors instructed the Secretary to inform Dr Fleming that they considered it fair that the Glasgow faculty should have one representative or two, if the other promoters of charter did not object.

AGRICULTURAL EDUCATION—Monday, Tuesday, and Wednesday, the 16th, 17th, and 18th March, were announced as the days of examination for the Society's agricultural certificate and diploma—candidates being required to lodge intimation of their intention to come forward on or before the 2d of March.

TECHNICAL EDUCATION.—The Secretary reported that Sir James Elphinstone and Mr Caird had, along with himself, represented the Society at the Conference on Technical Education, held in London on the 23d and 24th of January, and he laid on the table the resolutions adopted on the occasion.

At the request of the Council of the Society for the Encouragement of Arts, &c., London, the Secretary was instructed to give his aid in promoting the objects of the conference, by serving on the Standing Committee appointed to give effect to the resolutions referred to.

STANDING COMMITTEES FOR 1868.—The names of the gentlemen placed on the Standing Committees for the current year were read and approved.

ABERDEEN SHOW.—Letters were submitted from the clerk of supply for Kincardineshire, stating that the county had agreed to levy a voluntary assessment towards the expenses of the Aberdeen Show, and transmitting L.140. As already intimated, the counties of Aberdeen and Banff have also agreed to voluntary assessments to the amount of L.490 and L.120 respectively. The programme of the show, containing the premium list and regulations as finally adjusted, was laid on the table.

PROPOSED MONTHLY MEETINGS.—Sir THOMAS BUCHAN HEPBURN, Bart., reported, as convener of the committee recently appointed to consider the propriety of resuming the monthly meetings, first instituted by the Society in 1841 for the discussion of agricultural subjects, that the committee had held a meeting yesterday, when it had been arranged that Professor Williams would deliver a lecture on Wednesday, the 19th March, at two o'clock, on the causes of disease in the horse; that Dr Anderson would give an address in March; and that Mr M'Bride, Professor of Cattle Pathology to the Society, had undertaken to deliver a third lecture in April.

CULTIVATION BY STEAM.—The SECRETARY read the following letter from the Marquis of Tweeddale:—

"YESTER, *3d February* 1868.

"Dear Mr Menzies,—I have given a good deal of attention to the best means of coming to a satisfactory conclusion in regard to the question we are endeavouring to solve, which I consider requires a public and practical solution—that is, the comparative value of steam and horse power in cultivating the land.

"We have endeavoured by a series of queries to gain the information required from manufacturers of steam apparatus and farmers, both in England and Scotland, as a preliminary step towards gaining our object.

"It appears to me that a sufficient time has been allowed for that purpose, and now I would propose that a competition should take place in the same field between the steam-plough and horse-plough.

"I have a field of clay-land which has been drained at 15 feet apart, and has never been ploughed above 8 inches, most probably 7 inches, which I have lately taken into my own hands. This field will be ready for cross ploughing about the middle of March, when a trial could take place. I will produce seventeen pairs of horses to work against the steam-plough, so that it cannot be said the horses have been picked, as that is the number of pairs I have at work. As steam cultivation is stated to be the new means of breaking up the soil, I say that 12 inches is the depth that I will fix for the trial. I beg you will lay my proposition before the monthly Court of Directors.—Believe me, yours truly,

(Signed) "TWEEDDALE."

The Board instructed the Secretary to thank the Marquis for his proposal, and remitted the letter to the Special Committee on Steam Cultivation, with power to make the necessary arrangements for the trial—the Committee to report to next Board Meeting what sum they consider would be required for expenses.

MEETING OF DIRECTORS, 4TH MARCH 1868.

Mr REID, Drem, in the Chair.

TRANSACTIONS FOR 1868.—Mr IRVINE of Drum, Chairman of the Publication Committee, laid on the table No. 3 of the Fourth Series of the Transactions, containing nineteen prize reports, proceedings of Chemical Department, premiums offered during the current year, and other official documents.

FIELD EXPERIMENTS.—A minute of a meeting of the Chemistry Committee, held on the 12th of February, was read to the Board. The report stated that, after some conversation as to the number of experimenters required, and also in regard to the advisability of conducting experiments on both small and large plots, for the purpose of ascertaining whether the results correspond, the Committee recommended that Dr Anderson should communicate with the experimenters of last year, and, on receiving their opinions, consult with a sub-committee, consisting of Mr Harvey, Whittingham Mains; Mr Melvin, Bonnington; and Mr Park, Stoneyhill. The Committee, considering it of importance that each experimenter should note the rainfall during the time the experimental crops are growing, recommended that a rain-gauge should, where necessary, be furnished at the Society's expense. The course recommended by the Committee was approved of by the Directors.

STEAM CULTIVATION.—The Special Committee on Steam Cultivation, to whose consideration the Marquis of Tweeddale's leter, proposing a trial between steam cultivators and horse-ploughs on land at Yester, which had never before been

subjected to deep cultivation, had been remitted by the Board on the 5th of February, reported that they had held two meetings on the subject, and that nearly all the owners of steam cultivators in Scotland had been applied to, and as none had agreed to accept the terms of his lordship's letter, the trial for the present was at an end.

The Directors approved of the report.

A letter was read from Mr Alexander Leslie, Turriff, transmitting a copy of his patent "for improvements in apparatus for applying steam or other motive power to cultivate the soil and to actuate wheeled carriages," and intimating that he would be prepared to give any further information with reference to his invention, and, if desired, to show the apparatus at work.

The letter and relative papers were remitted to the Special Committee on Steam Cultivation.

Aberdeen Show.—Letters were read from Mr Angus, Town-clerk of Aberdeen, transmitting official excerpt from the minutes of the Aberdeen Town Council granting permission to the Society to use a portion of the Links for a showyard, and voting £75 towards the Premium Fund. On the motion of the Chairman, the Secretary was instructed to convey the thanks of the Board to the Town Council for their liberality.

A communication was submitted from Mr Anderson, Clerk of Supply for Forfarshire, in which it was stated that a voluntary subscription had been agreed to by the eastern division of that county, as had been done by the whole of the counties embraced in the district of the show.

A letter from Mr Stuart, Aldich, Secretary of the Spey, Avon, and Fiddochside Farming Association, intimating that the Society had resolved to subscribe twelve guineas in aid of the show at Aberdeen, was reported, and the thanks of the Board were voted to the Association.

A letter from Mr Geddes, Orbliston, transmitting one from Mr M'Combie, Tillyfour, on the subject of forage for the showyard, was submitted. The Board resolved to adhere to their former decision, and to furnish, as usual, forage at a certain tariff through the hands of a contractor—a local committee being appointed to see that the contract is properly carried out.

District Shows.—It was intimated that circulars, with premium books and relative blank returns, had been sent to 148 conveners and secretaries of local agricultural societies in regard to the competitions to be held during the present year.

Testimonial to the Rev. Patrick Bell, LL.D.—The Secretary, in submitting the accounts connected with the testimonial to the Rev. Dr Bell, of Carmylie, as the inventor of the first efficient reaping machine, stated that, irrespective of the subscription papers sent to all the bank agencies in Scotland, upwards of 5300 circulars had been issued, and the result had been that 753 individuals had subscribed. The newspaper press in England and Ireland, as well as in Scotland, had given every publicity to the testimonial, and the three daily newspapers in Edinburgh (the *Scotsman*, *Courant*, and *Review*) had inserted the advertisement at a reduced rate, while the two agricultural papers (the *North British Agriculturist* and *The Farmer*) had made no charge for the subscription lists and other notices. The accounts as closed are as follow:—

Charge.

Amount received and advertised,		£1000 13 6
Interest from Royal Bank,		4 18 7
		£1005 12 1

Discharge.

Paid Rev. Dr Bell,	£859 10 8	
Paid for plate,	27 0 0	
		£886 10 8
Postages and bank charges, £47, 2s. 1d.; printing, £27; stationery, £3, 9s.,		77 11 1
Advertising: *Scotsman*, £15, 3s. 3d.; *Courant*, £10, 10s. 4d.; *Daily Review*, £7, 9s. 6d.; country papers, £8, 7s. 3d.,		41 10 4
		£1005 12 1

Monthly Meetings of the Society.—The Chairman announced that the second monthly meeting would be held on Wednesday the 18th current, at two o'clock, when Dr Anderson, the Society's chemist, would deliver a lecture on "Some of the Relations of the Plant to the Soil." He added that the lecture would, as formerly, be advertised in the two Edinburgh agricultural papers on the Wednesday, and in the three daily newspapers on the Saturday preceding; and he expressed a hope, on the part of the Directors, that members would support the meetings by their attendance and by introducing their friends.

Agricultural Education.—It was reported that several candidates had intimated their intention of coming forward to be examined for the agricultural certificate and diploma of the Society.

The following gentlemen were named as a Committee of the Society to confer with the Edinburgh University Committee on applied science, with regard to the proposed agricultural department in the University:—Sir Thomas Buchan Hepburn; Mr Hope, Fenton Barns; Mr Russell, Pilmuir; Mr Stephens, Redbrae; Mr Lawson of Borthwick Hall.

MEETING OF DIRECTORS, 1st APRIL 1868.

Mr Stirling of Kippendavie, and afterwards Mr Walker of Bowland, in the Chair.

Agricultural Education.—It was reported that, at a meeting of the Council on Education, held on the 18th of March, the Society's diploma in agriculture had been conferred on Mr Thomas John Elliot, Wilton, Salisbury; and the certificate on Mr James Taylor, Allan Vale, Pitmuxton, Aberdeenshire.

Veterinary College Examinations.—Wednesday and Thursday, the 15th and 16th current, were named as the days for the examination of the students attending the Edinburgh Veterinary College; and it was resolved to award silver medals, as on former occasions, to those who pass the best examinations in anatomy, physiology, cattle pathology, horse pathology, chemistry, materia medica, and best general examination.

Aberdeen Show, 1868.—The Secretary was instructed to announce that the plans and specifications for the Aberdeen showyard would lie for the inspection of intending contractors at the Society's chambers, No. 3 George IV. Bridge, and at the office of the Local Secretaries, Messrs J. & R. Ligertwood, 87 Union Street, Aberdeen, after the 6th current.

There was laid on the table the draft of a letter to be addressed to the Conveners of the counties connected with the show in regard to the appointment of the General Committee of Management, and the number to be returned at the 30th of April meetings was fixed as follows:—Aberdeen, 20; Banff, 15; Kincardine, 15; eastern division of Forfar, 15; besides the Lords-Lieutenant, Vice-Lieutenants, Conveners, and Members of Parliament, who are members *ex officio* of the Committee. The number from the city of Aberdeen was arranged to be 20, and from the Royal Northern Society 15.

Edinburgh Show, 1869.—The Secretary was authorised to forward to the Conveners of the counties embraced in the district of the Edinburgh Show (the three Lothians) a list of the classes of stock, and to express a hope that the support which has been given on former occasions will again be afforded.

Monthly Meetings of the Society.—It was intimated that the lecture by Dr Anderson on "Some of the Relations of the Plant to the Soil," which was unavoidably postponed on the 18th of March, would be delivered in the Society's Hall, on Wednesday the 8th current, at two o'clock.

MEETING OF DIRECTORS, 30th APRIL 1868.

Mr Reid, Drem, in the Chair.

On the motion of the Chairman, seconded by Mr Graham Binny, it was unanimously resolved to call a special general meeting of the Society on Wednesday the 13th May, at one o'clock, for the purpose of voting a loyal and dutiful

address to Her Majesty tha Queen on the providential escape of His Royal Highness the Duke of Edinburgh from the recent attempt on his life, and also an address to His Royal Highness, congratulating him on his merciful preservation.

The Secretary was instructed to advertise the meeting in accordance with the charter, and a hope was expressed that it would be largely and influentially attended by members, in order publicly to testify their loyalty to the Throne and their attachment to the Royal Family.

MEETING OF DIRECTORS, 6TH MAY 1868.

Mr Goodlet, Bolshan, in the Chair.

General Meetings.—The Board approved of a special general meeting of the Society being held on the 13th May to vote addresses to Her Majesty the Queen and to His Royal Highness the Duke of Edinburgh.

The summer half-yearly general meeting, for the election of members and other business, was fixed for Wednesday, the 24th of June.

Field Experiments.—On the recommendation of the Chemistry Committee, of which Dr Anderson is Convener, it was resolved to repeat the experiments on the small scale system in four districts, with two experimenters in each. In regard to the experiments on the large scale, it was agreed that they should be conducted by eight experimenters in different districts, and extend over a four-course rotation.

Veterinary College.—It was reported that the examination of the students at the Edinburgh Veterinary College had taken place on the 15th and 16th of April, when the Society's diploma had been conferred on 29 candidates, and six silver medals awarded to those who passed the best examination in anatomy, chemistry, horse pathology, materia medica, physiology, and best general examination.

Agricultural Education.—A letter was read from Professor Wilson, announcing that the prizes of L.6 and L.4 annually allowed by the Society to the students in the agricultural class in the Edinburgh University who pass the best and second best examinations, had this year been awarded to—1. G. R. Glendinning, Mid-Lothian ; 2. G. G. Bursby, Northumberland ; and that the prizes had as formerly been given in books.

Aberdeen Show.—On the motion of the Chairman, the Directors resolved to take the erection of the showyard into their own hands, and to entrust the superintendence to Messrs John Watherston & Sons, Edinburgh, the Society's Masters of Works—the lowest estimate received having exceeded by L244 the cost of the Glasgow showyard, where the erections were much more extensive.

MEETING OF DIRECTORS, 13TH MAY 1868.

Mr Reid, Drem, in the Chair.

The business had reference to the Addresses to be presented to Her Majesty the Queen, and His Royal Highness the Duke of Edinburgh.

MEETING OF DIRECTORS, 3D JUNE 1868.

Mr Stirling, of Kippendavie, in the Chair.

Address to the Queen.—The Secretary reported that, in terms of the instructions received at the Special General Meeting on the 13th of May, he had forwarded the addresses to the Queen and His Royal Highness the Duke of Edinburgh to the Duke of Montrose for presentation, and that his Grace had since received a letter from the Principal Secretary of State for the Home Department

intimating that Her Majesty had been pleased to receive the address very graciously.

The address to the Duke of Edinburgh will be presented by the Duke of Montrose on the arrival of His Royal Highness.

VETERINARY CHARTER.—A letter was read from the Board of Trade announcing that the Lords of the Council have refused to recommend to her Majesty to grant a veterinary charter for Scotland.

PAPERS IN COMPETITION.—Various premiums were awarded for reports, which will be intimated at the next general meeting.

TRANSACTIONS.—The prize essays and reports were laid on the table; and it was remitted to Mr Irvine of Drum, Chairman of the Committee on Publications, to select those for publication in the next number of the Transactions.

ABERDEEN SHOW.—A plan of the showyard at Aberdeen, showing the position of the different erections, was submitted and approved of.

Mr F. N. MENZIES reported correspondence between the secretaries of the different railways in Scotland and himself in reference to some more liberal arrangement as to the rates charged for stock sent to the general shows of the Society, from which it appeared that the subject was brought before a meeting of the general managers of the English and Scotch railways, held at the Clearing House in London in May last, when it was decided to adhere to the following regulations, which have been for some time in force:—

1. Stock and implements to the show to be charged full rates.
2. From the show, if sold, full rates.
3. From the show, if unsold, to be conveyed free back to the station whence they were sent, at owners' risk, on production of a certificate from the secretary of the agricultural show to the effect that they are really unsold.
4. All the above to be carried at owners' risk.
5. Collection and delivery to be performed by the owners.
6. Regulations Nos. 1, 2, 3, as to cattle and horses, apply only if traffic be conveyed in cattle waggons and by goods trains.
7. Poultry and dogs to be charged full rates both ways.
8. No reduction in the ordinary rates for horses or cattle when conveyed in horse boxes.
9. Parties requiring the exclusive use of a horse-box for only one animal, to be charged one fare and a half.

The Secretary stated that, on the other hand, the directors of the Highland Railway Company had very handsomely agreed to carry unsold stock going home from the Aberdeen show in horse-boxes free of charge; and to run special trains with stock to or from the show, if the numbers are sufficient.

AGRICULTURAL EDUCATION.—It was reported that at the recent examinations by the Royal Agricultural Society of England the principal prizes were gained by students in the class of agriculture in the Edinburgh University, and that every one of the Edinburgh agricultural candidates took a first prize. There were twelve candidates, of whom six obtained prizes, and out of six prizemen four were Edinburgh men—three of them having already obtained the diploma of the Highland Society. The following are the prizemen referred to:—

S. H. Walton	Science and Practice of Agriculture	L.10
G. K. Walton	Agricultural Chemistry	10
R. Brydon	Veterinary Science	10
R. G. Scriven	Geology	5
do.	Botany	5

GENERAL MEETING.—The subjects to be brought before the General Meeting on the 24th of June were arranged, and the Secretary submitted the names of the Candidates for election as members.

MEETING OF DIRECTORS, 24TH JUNE 1868.

Mr GOODLET, Bolshan, and afterwards His Grace the DUKE OF BUCCLEUCH, K.G., President of the Society, in the Chair.

The business had relation to the Aberdeen Show, and the subjects to be brought before the General Meeting of this date.

MEETING OF DIRECTORS, 4TH NOVEMBER 1868.

Mr GRAHAM BINNY in the Chair.

ABERDEEN SHOW.—On reports by the Local Committee on Implements, silver medals were awarded to,—1*st*, Benjamin Reid & Company, Aberdeen, for improvements in fixing the coulter of their general purpose lever drill, combined with the power of adaptation to act as a horse hoe when required; 2*d*, To George Sellar and Son, Huntly, for the improved form and mode of fixing the tynes of their zigzag harrows; and 3*d*, To J. Bisset & Sons, Blairgowrie, for their reaping-machine exhibited at the trial held at Portlethen, after the Aberdeen Show.

The Secretary stated that the report by the Local Committee on the ploughs, &c., tried at Broomhill, near Aberdeen, on the 24th of October, had not yet been received.

EDINBURGH SHOW, 1869.—On the motion of the CHAIRMAN, it was remitted to Committee on General Shows to fix the money premiums and adjust the regulations for the Show to be held at Edinburgh next year.

The SECRETARY read a letter from the Town Council of Edinburgh agreeing to give the West Meadow Park as a site for the showyard; and he was instructed to convey to the Town Council the thanks of the Board.

PROPOSED SHOW AT DUMFRIES IN 1870.—The following requisition, addressed to the Secretary, and forwarded to him by Mr Dudgeon of Cargen, was read:—

"DUMFRIES, *5th August* 1868.

"SIR,—It being now eight years since a meeting of the Highland and Agricultural Society has been held at Dumfries, we think the time is now approaching when it would be of great advantage to this district to have another show here; and we would feel obliged if you would take an early opportunity of laying before the Directors of the Society our request with regard to this matter, feeling assured that it is the universal wish of the district that such a meeting should be held, and we take this opportunity of informing the Directors that we will do all in our power to promote the success of the meeting.

"We would suggest that, if it does not interfere with the other arrangements of the Society, that the meeting be held here in 1870."

The SECRETARY stated that the requisition was signed by the Duke of Buccleuch, the Marquis of Queensberry, the Earls of Selkirk, Galloway, and Stair; Viscount Garlies, Sir William Jardine, Sir William Maxwell, Sir Andrew Agnew, M.P. for Wigtownshire; Sir J. C. D. Hay; Mr Hope Johnstone, Convener of Dumfriesshire; Mr Maxwell, M.P., Convener of the Stewartry of Kirkcudbright; Mr Vans Agnew, Convener of Wigtownshire; Major Walker, M.P.; the Provosts of Dumfries, Maxwelltown, Kirkcudbright, New Galloway, and Castle-Douglas; and about two hundred others connected with Dumfriesshire, the Stewartry of Kirkcudbright, and Wigtownshire; and that, according to the usual rotation, the meeting fell to be held in the Dumfries district in 1870, the year prayed for in the requisition.

On the motion of Mr DUNDAS of Arniston, seconded by Mr CAMPBELL SWINTON of Kimmerghame, it was unanimously resolved to recommend to the general meeting in January to comply with the request, and it was remitted to the Committee on General Shows to suggest the classes of stock for which premiums will be afterwards offered, and to make other arrangements.

MISCELLANEOUS REMITS.—The following remits were made:—

1*st*, To the Committee on Office-Bearers to report on the vacancies for 1869.

2*d*, To the Reading Committee to consider and report on the papers lodged in competition.

3*d*, To the Committee on Premiums for Essays and Reports to revise the list of 1868 and consider the suggestions for 1869.

4*th*, To the Committee on District Competitions to revise the Reports for 1868, and consider the applications for 1869.

SHOWS OF FAT STOCK.—A letter was read from Mr Curror on behalf of the Edinburgh Christmas Club, of which he is honorary secretary, expressing a hope that the Directors would double the grant of L.50 voted to the Club last year, and stating that it was proposed this year to apply the money in payment of the ordinary Club prizes. The application was supported by Mr Mylne, Niddrie Mains; and, after some discussion, it was, on the motion of the Chairman, resolved to

repeat the grant, on the understanding that the subject of grants for Fat Stock Shows will be brought before the general meeting of the Society in January.

On an application by Mr Hugh Rose, Inverness, four silver medals were placed at the disposal of the Northern Counties' Fat Show Club, for—1*st*, best Ox; 2*d*, best Cow or Heifer; 3*d*, best Pen of Sheep; 4*th*, best Pig,—to be competed for at Inverness on the 4th of December next.

Letters from Mr Grant of Kincorth; Mr Geddes, Orbliston; Mr Scott, Glendronach, and Mr Harris, Earnhill, on the subject of a grant to the Forres and Northern Fat Cattle Club for 1869, were remitted to the Committee on District Shows,—the Club being already on the list of medals for the current year.

A communication was read from Messrs James Stewart, J. and W. Martin, and Thomas Knowles, Aberdeen, suggesting that the prizes of the medium gold, silver, and medium silver medals, now offered as first, second, and third premiums for fat stock at the Society's General Shows, should in future be L.15, L10, and L.5; and that the successful exhibitors of fat stock should each receive a medal in addition to the money prize. The letter was referred to the Committee on General Shows.

Milking Dairy Stock.—A letter was read from Mr Hamilton Hay, Secretary of the Scottish Society for the Prevention of Cruelty to Animals, calling attention to the want of some rule with reference to the milking of dairy stock within a limited time, prior to their passing the judges in agricultural exhibitions. Mr Hay states that "at present practices are resorted to which create a very unnecessary amount of suffering, to say nothing either of the injury to the animals kept so long in milk, whether by artificial obstruction, or simply from want of natural relief, or to the unfairness of such practices towards other competitors, who do not resort to such inhumane methods of showing a good milker," and it is thought that "the evil would be most effectually met by some resolution or recommendation from the Highland Society, which would, doubtless, be speedily adopted by minor affiliated societies." The communication was, on the motion of the Chairman, remitted for consideration to the Committee on General Shows.

Potato Disease, &c.—Communications from Mr Thomas Stevenson, Johnstone, and from Mr Taylor, Howwood, Johnstone, on the potato disease; and from Mons. X. de Bouge in regard to his work, entitled "The Continental Tutor," were brought under the notice of the Board.

Precepts.—The Premiums awarded at the Aberdeen Show in July last were confirmed by the Board, and the Chairman was authorised to sign the necessary precepts to be issued by the Secretary.

MEETING OF DIRECTORS, 2d DECEMBER 1868.

Mr Walker of Bowland, and afterwards Sir Thomas Buchan Hepburn, Bart., in the Chair.

Edinburgh Christmas Club.—A letter was read from Mr Curror, Secretary o the Edinburgh Christmas Club, thanking the Board for the grant of L.50 voted at last meeting in aid of the general premiums of the Club, and expressing a hope that the ensuing Show would be such as to meet with the approval of the Directors and the Members of the Highland Society.

General Meeting.—The anniversary general meeting of the Society for the election of members, and for other business, was fixed, pursuant to the charter, to be held on Wednesday the 20th January 1869.

Office-Bearers for 1869.—The Report of the Committee on Office-Bearers for 1869 was given in, and the Secretary was instructed to communicate with the noblemen and gentlemen proposed to fill the vacancies which occur in January next, before publishing their names.

Finance.—Mr F. N. Menzies submitted the pass-book exhibiting the balance on the ordinary account with the Royal Bank at the close of the financial year on 30th of November, and stated that the books and vouchers had been sent to the auditor, who would prepare the usual abstract of the accounts for publication before the general meeting.

Aberdeen Show, 1868.—The Report of the Local Committee on the Implements

tried at Broomhill, near Aberdeen, on the 24th of October last, was given in, and silver medals were awarded to John Thomson, King Street Road, Aberdeen, for a three-horse lever grubber, and to William Rae, Bourtie, Old Meldrum, for a turnip-sowing machine.

In regard to Mr Duff's rotatory digger, the Committee reported favourably. They considered it most suitable for loamy and deep classes of land, which it could pulverise sufficiently for sowing crop or for breaking up clay or stiff soils, the land being thoroughly loosened to the depth of 8 or 10 inches, so that the crop might have been sown immediately thereafter. They add—"No doubt the machine will by-and-by be considerably improved under the persevering enterprise of its inventor, Mr Thomas Duff, Perth."

On the motion of Sir Thomas Buchan Hepburn, Bart., seconded by Mr Lawson of Borthwick Hall, the thanks of the Board were voted to the Local Committee, consisting of Major Ramsay of Barra, Convener; Mr James Abernethy, C.E., Aberdeen; Mr Walker, Portlethen; Mr Campbell, Blairton; and Mr Porter, Monymusk; to the Local Secretaries, Messrs John and Robert Ligertwood, Aberdeen: and also to Mr Walker, Portlethen, and Mr Monro, Broomhill, for putting at the disposal of the Committee various kinds of land in every way suitable for the different implements tried in August and October.

General Shows.—The report of the Committee on General Shows was submitted, and the Board approved of the allocation of about L.1500, to be given as premiums in money or in medals at the Edinburgh Show next year, in the classes of stock some time ago published.

The report states that the various letters on the subject of money premiums for fat stock, referred to in the proceedings of last month and remitted to the Committee on General Shows, had been taken up; and that after careful consideration the usual premiums of the medium gold, silver, and medium silver medals had had been recommended to be adhered to. The Board approved of the course suggested by the Committee.

Two additional sections were added in the class of extra horses—viz., mares or geldings between 12 and 14 hands high, and mares or geldings under 12 hands.

In consequence of the letter from the Secretary of the Scottish Society for the Prevention of Cruelty to Animals, in regard to the milking of dairy stock, which was before the Board in November, and referred to this Committee, the following was recommended as a regulation at future shows of the Society:—"All milk cows must have been milked dry the evening previous to being judged; and they must, while within the showyard, be milked morning and evening. The judges will be instructed to withhold the prizes from any animals overstrained or suffering from want of being milked." The Directors unanimously adopted the rule; and it was accordingly added to the general regulations for the Edinburgh Show.

The report further narrates, that owing to the days at present set aside for the show, judges, members of the deputation of Directors, and others coming from a distance, were under the necessity of leaving their homes on the previous Saturday; and for a similar reason a large number of the stock was placed in the showyard on the same day, thus entailing on exhibitor's the cost of two or three days' additional keep, which might be avoided were the period made a day later. The Committee, believing that the change of one day would be of considerable advantage to all parties, recommended that the days should be Wednesday, Thursday, and Friday, in place of Tuesday, Wednesday, and Thursday. This suggestion met with the approval of the Directors; and the Secretary was instructed to bring the matter before the meeting of the members in the Edinburgh district, and at the general meeting of the Society. If the change is then finally adopted, the Show at Edinburgh will be held on the 28th, 29th, and 30th July—the week between the meetings of the Royal Agricultural Society of England and the Yorkshire Society.

The classes of stock for which premiums will be afterwards offered at the proposed show at Dumfries in 1870, as fixed by the Committee on General Shows, were approved of by the Board, and the Secretary was directed to submit the list to a meeting of members to be held at Dumfries during this month.

Local Shows.—The Secretary reported that the Committee on District Competitions had held a meeting on the 25th of November, when the returns relating to the competitions held in the various districts in receipt of the Society's premiums had been revised. The Committee had at the same time the different

grants for 1869 under consideration. The report was approved by the Directors, and will be brought before the general meeting in January.

In regard to the applications on behalf of the Forres and Northern Fat Cattle Club, for additional assistance, the Committee regret that they cannot recommend the Directors to vote a sum of money in aid of local fat shows, but suggest that in the meantime the medals should be continued. The Board unanimously adopted the report.

MEETING OF DIRECTORS, 6TH JANUARY 1869.

The DUKE OF BUCCLEUCH AND QUEENSBERRY, K.G., President, in the Chair.

OFFICE-BEARERS FOR 1869.—Mr F. N. MENZIES reported that the noblemen and gentlemen proposed for election at the general meeting of the Society on the 20th current, to fill the vacancies in the list of office-bearers, had all agreed to act.

The Duke of BUCCLEUCH expressed his willingness to continue in office for another year, so as to complete the period specified in the charter, but as a great desire had been evinced by many members that the range of the choice of President should be widened, and as a strong feeling existed in favour of the Marquis of Tweeddale being elected to the office of President, it appeared to his Grace that this would be a fit opportunity to nominate his Lordship. Owing to the Show being held at Edinburgh this year, his Grace thought it would be a proper compliment to ask the Marquis to take the President's chair when the Show took place in his immediate district.

In accordance with his Grace's desire, it was agreed that the Marquis of Tweeddale should be transferred from the list of Vice-Presidents to the Presidentship of the Society.

Sir WILLIAM STIRLING-MAXWELL then moved that the Earl of Dalkeith should be appointed Vice-President in room of the Marquis.

The list as amended will be submitted to the General Meeting for confirmation.

FINANCE.—Mr KENNETH MACKENZIE, C.A., the Society's auditor, laid on the table abstracts of the accounts for 1867-68, along with a state of the funds at the close of the financial year on 30th November last. The accounts were signed, in terms of the bye-laws, by two members of the Finance Committee, and by the auditor.

GENERAL MEETING.—The following programme of business for the General Meeting was agreed to:—Election of office-bearers; election of members; accounts for 1867-68; thanks to be voted to local authorities connected with Aberdeen Show, 1868; arrangements for Edinburgh Show, 1869; requisition from Dumfries district for Show in 1870; district competitions in 1868, and grants for 1869; vote by Government to Chair of Agriculture; proceedings of the chemical department; premiums awarded in 1868, and offered in 1869 for essays and reports; and contents of No. 4 (fourth series) of the Society's Transactions.

EDINBURGH CHRISTMAS CLUB.—The following notice of motion by Mr MYLNE, Niddrie Mains, for the General Meeting was read:—"That the Society support the Edinburgh Christmas Club with a vote of L.100 per annum, and otherwise patronise it with a grant of medals, &c." A letter from Mr Lyall, Old Montrose, supporting the motion, was read by the Secretary; and after various members had expressed their opinion, Mr Elliot, Laighwood, proposed, and Sir William Stirling-Maxwell, Bart., seconded the following resolution:—"That the sum of L.50 be granted for the year 1869 to the Edinburgh Christmas Club, as being the Metropolitan Fat Stock Show of Scotland." This sum to be at the disposal of the Club, and not given in special prizes by the Society.

On a vote being taken, Mr Elliot's motion was carried, and it was agreed to transmit it to the general meeting, Mr Mylne giving notice that he would probably propose an amendment.

NEW MEMBERS.—The names of candidates for admission as members were reported and approved of; and the Secretary stated, that as there would be a meeting of Directors previous to the general meeting, he could receive names of candidates up to the morning of the 20th, in terms of the bye-laws.

Edinburgh Show, 1869.—The report of the meeting of members, held at Edinburgh on 9th December, was submitted; and with reference to the remarks which were then made in regard to the overfed state of bulls and other stock exhibited at the general Shows of the Society, the following new rule was recommended, and the Secretary was instructed to insert it in the general regulations for the Edinburgh Show :—"Breeding stock must not be shown in an improper state of fatness, and the judges will be prohibited from awarding premiums to overfed animals."

Proposed Show at Dumfries in 1870.—Mr F. N. Menzies reported that he had attended a meeting at Dumfries on the 16th December, when the list of classes of stock, as fixed by the Committee on General Shows, and agreed to by the Directors, had been submitted and approved of, subject to certain alterations and additions suggested for the consideration of the Directors. These suggestions were on Wednesday adopted by the Board, and the list as adjusted will be brought up along with the requisition from the district, for the sanction of the General Meeting.

Premium Book for 1869.—Various subjects for which premiums were offered in 1868 were deleted from the list, and the following were added :—Reports—On the farming customs and covenants of leases formerly in the use in the various districts or counties of Scotland; on the various modes of striking the fiars prices throughout the different counties of Scotland; on the cheapest, speediest, and most convenient mode of covering the grain crops in harvest; on improved methods of transporting dead meat for distances that may occupy from twenty-four to forty-eight hours, so that it may arrive in the least injured condition; on improvements in the vessels used for transporting milk from country districts to the neighbouring towns; on the advantages of a system of contract entered into by stockowners and veterinary surgeons; on the comparative advantages in point of economy, as well as durability of home-grown timber, as compared with foreign for general out-door estate work; on the effects of the very dry season of 1868 on trees and shrubs in different soils, situations, and elevations; on the results obtained by experience of seedlings of conifers, being the produce of trees grown in Britain, as compared with plants obtained from foreign ripened seed.

Essays and Reports.—Several awards were made for reports lodged in competition for premiums; and the authors' names will be announced at the ensuing general meeting.

Veterinary Charter for Scotland.—A correspondence between Bailie Stott, Mr Marwick, and the Secretary, in regard to renewed application to the Board of Trade for a chartered veterinary college for Scotland, was read to the Board, but it was considered inexpedient to move in the matter at present.

Reid's Patent Cattle Waggons.—Drawings of Reid's patent watering, feeding, and ventilating cattle waggons were laid on the table, and remitted to the Machinery Committee.

Propagating Potatoes from Seed.—A communication was read from Mr Henry Stephens, the author of "The Book of the Farm," in regard to the services of Mr William Paterson, Dundee, in propagating potatoes from seed, and suggesting that the Society's gold medal might be conferred on him.

The Secretary was instructed to inform Mr Stephens that Mr Paterson should transmit a report on the subject, when, if approved, the gold medal may be awarded.

Cottage Premiums.—On an application by Sir Alexander Bannerman of Crimmonmogate, it was resolved to offer the medium silver medal to local associations or individuals, who, at their own expense, establish premiums for cottages or gardens. The annual value of each cottage, with the ground occupied in the parish by competitor, must not exceed L.15; and premiums to the amount of L.2 must be awarded for each medal claimed.

MEETING OF DIRECTORS, 20th JANUARY 1869.

The business had reference principally to the general meeting of this date.

PREMIUMS AWARDED BY THE SOCIETY IN 1868–69.

I.—REPORTS, 1868-69.

1. L.15 to James Black, *Courant* Office, Elgin, for a Report on the Agriculture of Aberdeenshire and Banffshire.
2. The Gold Medal or L.10 to George Armatage, M.R.C.V.S., Leighton Buzzard, Beds, for a Report on Pleuro-Pneumonia.
3. The Gold Medal or L.10 to William Brown, junior, Edderstone, Peebles, for a Report on Sanitary Arrangements for Stock.
4. The Gold Medal or L.10 to George Menzies, Trentham, Stoke-upon-Trent, for a Report on the Transit of Stock.
5. The Gold Medal or L.10 to C. Y. Michie, Forester, Cullen House, Cullen, Banffshire, for a Report on the Formation and Management of Young Plantations.
6. The Gold Medal or L.10 to James Purves, Lochend, Thurso, for a report of the Improvement of Meadow Pasturage on part of the Crown lands of Dorrery, in the county of Caithness.
7. The Medium Gold Medal or L.5 to John E. Brown, Wass, Oswaldkirk, Yorkshire, for a Report on American and Canadian Forest Trees.
8. The Medium Gold Medal or L.5 to John Honeyman, Crosby, Isle of Man, for a Report on the Isle of Man—its Agriculture, Climate, &c.
9. The Medium Gold Medal or L.5 to Robert Hutchison of Carlowrie, Kirkliston, for a Report on the Management of Poultry.
10. The Silver Medal to H. Newby Fraser, Wyseby Hill, Ecclefechan, for a Report on the Agrcuilture of Dumfriesshire.
11. The Silver Medal to William Gilchrist, Forester, Midmar Castle, Echt, Aberdeenshire, for a Report on the formation and management of Young Plantations.
12. The Silver Medal to Robert Hutchison of Carlowrie, Kirkliston, for a Report on Trees not liable to be destroyed by Rabbits.
13. The Silver Medal to Robert Hutchison of Carlowrie, Kirkliston, for a Report on Forest Trees of recent introduction into Scotland.
14. The Silver Medal to C. Y. Michie, Cullen House, Cullen, for a Report on Experiments and Improvements on Wire Fencing.
15. The Silver Medal to John Morrison, Coney Park Nursery, Stirling, for a Report on the Corsican Fir.

II.—ABERDEEN SHOW, 1868.

CLASS I.—CATTLE.

SHORTHORN.

First Prize Bulls at former Shows.—Exhibited for Medium Gold Medal.
Kelso, 1863, when the property of Sir William Stirling Maxwell, Bart., M.P.—"Forth." Amos Cruickshank, Sittyton, Aberdeen.

Section

1. Bulls calved before 1st January 1866.—Premiums, L.20—L.10—and Medium Silver Medal. Breeder of best Bull—Silver Medal. *1st.* George Robertson Barclay of Keavil, Dunfermline. *2d.* James Cochrane, Little Haddo, Newburgh. *3d.* James Whyte, Little Clinterty, Blackburn, Aberdeen. Commended—Charles Bruce, Broadland, Huntly. Breeder of best Bull—George Robertson Barclay of Keavil, Dunfermline.
2. Bulls calved after 1st January 1866.—Premiums, L.20—L.10—and Medium Silver Medal. *1st.* George Marr, Cairnbrogie, Old Meldrum. *2d.* David Ainslie of Costerton, Blackshiels. *3d.* John Copland, Mainshead, Dumfries. Commended—Walter Scott, Glendronach, Huntly.
3. Bulls calved after 1st January 1867.—Premiums, L.10.—L5—and Medium Silver Medal. *1st.* George Robertson Barclay of Keavil, Dunfermline. *2d.* William S. Marr, Upper Mill, Tarves. *3d.* George Robertson Barclay of Keavil, Dunfermline. Commended—James Bruce, Burnside, Fochabers.
4. Bull Calves calved after 1st January 1868.—Premiums, L.6—L.3—and Medium Silver Medal. *1st.* John Copland, Mainshead, Dumfries. *2d.* Alexander Bruce, Wealthiton, Keig. *3d.* No award.

First Prize Cows at former Shows—Exhibited for Medium Gold Medal.
Glasgow, 1867, when the property of the present Exhibitor—"Lady Hay." Francis Brown, Mains of Leslie, Insch, Aberdeen.
Inverness, 1865, when the property of Viscount Strathallan—"Rosa Bonheur." The Duke of Richmond, K.G., Gordon Castle, Fochabers.

5. Cows of any age.—Premiums, L.15—L.8—and Medium Silver Medal. *1st.* George Shepherd, Shethin, Tarves. 2. Amos Cruickshank, Sittyton, Aberdeen. *3d.*

Section

Charles Bruce, Broadland, Huntly. Commended—Amos Cruickshank, Sittyton, Aberdeen.

6. Heifers calved after 1st January 1866.—Premiums, L.10—L.5—and Medium Silver Medal. *1st.* David Ainslie of Costerton, Blackshiels. *2d.* The Duke of Buccleuch, Dalkeith Park, Dalkeith. *3d.* Lord Kinnaird, K.T., Rossie Priory, Inchture. Commended—Amos Cruickshank, Sittyton, Aberdeen.

7. Heifers calved after 1st January 1867.—Premiums, L.8—L4.—and Medium Silver Medal. *1st.* David Ainslie of Costerton, Blackshiels. *2d.* Lord Kinnaird, K.T., Rossie Priory, Inchture. *3d.* David Ainslie of Costerton, Blackshiels. Commended—John Hunter, Dipple, Fochabers.

8. Heifer Calves calved after 1st January 1866.—Premiums, L.6—L.3—and Medium Silver Medal. *1st.* Robert Scott, Manbeen, Elgin. *2d.* William A. Mitchell, Auchnagathle, Aberdeen. *3d.* Henry A. Rannie, Mill of Royndie, Banff.

POLLED ANGUS OR ABERDEEN.

First Prize Bulls at former Shows—Exhibited for Medium Gold Medal.

Glasgow, 1867, when the property of the Earl of Southesk—"Jupiter." Alexander Paterson, Mulben, Keith.

9. Bulls calved before 1st January 1866.—Premiums, L.20—L10—and Medium Silver Medal. Breeder of Best Bull—Silver Medal. *1st.* Alexander Morison of Bognie, Turriff. *2d.* William James Tayler, Rothiemay House, Huntly. *3d.* Robert Walker, Portlethen, Aberdeen. Commended—Colonel Fraser, Castle Fraser, Aberdeen. Breeder of best Bull—Alexander Morison of Bognie, Turriff.

10. Bulls calved after 1st January 1866.—Premiums, L.20—L.10—and Medium Silver Medal. *1st.* William M'Combie of Easter Skene, Skene, Aberdeen. *2d.* William M'Knight, Boghead, Pitcaple. *3d.* Robert Walker, Portlethen, Aberdeen. Commended—William M'Combie, Tillyfour, Aberdeen.

11. Bulls calved after 1st January 1867.—Premiums, L.10—L.5—and Medium Silver Medal. *1st.* George Brown, Westertown, Fochabers. *2d.* The Earl of Dunmore, Dunmore, Stirling. *3d.* Robert Walker, Portlethen, Aberdeen. Commended—Colonel M'Inroy of the Burn, Brechin.

12. Bull Calves calved after 1st January 1868.—Premiums, L.6—L.3—and Medium Silver Medal. *1st.* William M'Combie, Tillyfour, Aberdeen. *2d.* David Rait Lyall Grant of Kingsford, Alford. 3. Robert Walker, Montbletton, Banff. Commended—William M'Combie, Tillyfour, Aberdeen.

First Prize Cows at former Shows—Exhibited for Medium Gold Medal.

Glasgow, 1867, when the property of the present Exhibitor—"Mina." Colonel Charles Fraser, Castle Fraser, Aberdeen.

Inverness, 1856, when the property of the present Exhibitor—"Charlotte." William M'Combie, Tillyfour, Aberdeen.

Dumfries, 1860, when the property of the present Exhibitor—"Pride of Aberdeen." William M'Combie, Tillyfour, Aberdeen.

Stirling, 1864, when the property of the present Exhibitor—"Daisy." William M'Combie, Tillyfour, Aberdeen.

Inverness, 1865, when the property of the present Exhibitor—"Lovely." William M'Combie, Tillyfour, Aberdeen.

Kelso, 1863, when the property of the late J. H. E. Wemyss—"Nancy." The Trustees of the late J. H. E. Wemyss, Wemyss Castle, Kirkcaldy.

13. Cows of any Age.—Premiums, L.15—L.8—and Medium Silver Medal. *1st.* Colonel Fraser, Castle Fraser, Aberdeen. *2d.* William W'Combie, Tillyfour, Aberdeen. *3d.* William M'Combie, Tillyfour, Aberdeen. Commended—William Walker, Ardhuncart, Mossat, Aberdeen.

14. Heifers, calved after 1st January 1866.—Premiums, L.10—L.5—and Medium Silver Medal. *1st.* James Skinner, Drumin, Ballindalloch. *2d.* The Earl of Southesk, Kinnaird Castle, Brechin. *3d.* William M'Combie, Tillyfour, Aberdeen. Commended—William M'Combie, Tillyfour, Aberdeen.

15. Heifers, calved after 1st January 1867.—Premiums, L.8—L.4—and Medium Silver Medal. *1st.* William M'Combie, Tillyfour, Aberdeen. *2d.* William M'Combie, Tillyfour, Aberdeen. *3d.* The Earl of Dunmore, Dunmore, Stirling. Commended—Alexander Paterson, Mulben, Keith.

16. Heifer Calves calved after 1st January 1868.—Premiums, L.6—L.3—and Medium Silver Medal. *1st.* William M'Combie, Tillyfour, Aberdeen. *2d.* William M'Combie, Tillyfour, Aberdeen. *3d.* No Entry.

POLLED GALLOWAY.

17. Bulls calved before 1st January 1866.—Premiums, L.20—L.10—and Medium Silver Medal. Breeder of best Bull—Silver Medal. *1st.* James Cunningham, Tar-

Section
breech, Dalbeattie. *2d.* James Graham, Parcelstown, West Linton, Carlisle. *3d.* No entry. Breeder of best Bull—John Thomson, Blaiket, Crocketford, Dumfries.

18. Bulls calved after 1st January 1866.—Premiums, L.20—L.10—and Medium Silver Medal. *1st.* James Graham, Braidlee, Newcastleton. *2d.* James Cunningham, Tarbreoch, Dalbeattie. *3d.* John Cunningham, Whitecairn, Dalbeattie.

19. Bulls calved after 1st January 1867.—Premiums, L.10—L.5—and Medium Silver Medal. *1st.* John Fisher, Knells, Carlisle. *2d.* James Cunningham, Tarbreoch, Dalbeattie. *3d.* No entry.

First Prize Cows at former Shows—Exhibited for Medium Gold Medal.
Glasgow, 1867, when the property of the present Exhibitor—"Modesty." James Graham, Parcelstown, West-Linton, Carlisle.

20. Cows of any Age.—Premiums, L.15—L.8—and Medium Silver Medal. *1st.* James Cunningham, Tarbreoch, Dalbeattie. *2d.* James Cunningham, Tarbreoch, Dalbeattie. *3d.* No award.

21. Heifers calved after 1st January 1866.—Premiums, L.10—L.5—and Medium Silver Medal, *1st.* James Cunningham, Tarbreoch, Dalbeattie. *2d.* The Duke or Buccleuch, K.G., Drumlanrigg, Thornhill. *3d.* James Cunningham, Tarbreoch, Dalbeattie.

22. Heifers calved after 1st January 1867.—Premiums, L.8—L.4—and Medium Silver Medal. *1st.* James Graham, Parcelstown, West Linton, Carlisle. *2d.* James Graham, Parcelstown, West Linton, Carlisle. *3d.* The Duke of Buccleuch, K.G., Drumlanrigg, Thornhill,

HIGHLAND.

First Prize Bulls at former Shows—Exhibited for Medium Gold Medal.
Inverness, 1865, when the property of the Duke of Athole—"Donald." The Hon. Lady Menzies, Rannoch Lodge, Pitlochry.
Glasgow, 1867, when the property of the present Exhibitor—Robert Peter, Urlar, Aberfeldy.

23. Bulls calved before 1st January 1865.—Premiums, L.20—L.10—and Medium Silver Medal. Breeder of best Bull—Silver Medal. *1st.* John Malcolm of Poltalloch, Callton Mor, Lochgilphead. *2d.* The Duke of Athole, K.T., Blair Castle, Blair Athole. *3d.* Alexander Fraser, Faillie, Inverness. Breeder of best Bull—John Malcolm of Poltalloch.

24. Bulls calved after 1st January 1865.—Premiums, L.20—L.10—and Medium Silver Medal. *1st.* The Duke of Athole, Blair Castle, Blair Athole. *2d.* Donald M'Laren, Corrychrone, Callander. *3d.* James Gordon of Manar, Inverurie. Commended—James Gordon of Manar, Inverurie.

25. Bulls calved after 1st January 1866.—Premiums, L.10—L.5—and Medium Silver Medal. *1st.* John Stewart, Duntulm, Portree. *2d.* John Stewart, Duntulm, Portree. *3d.* The Hon. Lady Menzies, Rannoch Lodge, Pitlochry.

First Prize Cows at former Shows—Exhibited for Medium Gold Medal.
Kelso, 1863, when the property of the present Exhibitor—"Rosie." The Duke of Athole, K.T., Blair Castle, Blair Athole.

26. Cows of any age.—Premiums, L.15—L.8—and Medium Silver Medal. *1st.* John Malcolm of Poltalloch, Callton Mor, Lochgilphead. *2d.* John Stewart, Duntulm, Portree, *3d.* The Duke of Athole, K.T., Blair Castle, Blair Athole. Commended—Robert Peter, Urlar, Aberfeldy.

27. Heifers calved after 1st January 1865.—Premiums, L.10—L.5—and Medium Silver Medal. *1st.* Robert Peter, Urlar, Aberfeldy. *2d.* John Malcolm of Poltalloch, Callton Mor, Lochgilphead. *3d.* Robert Peter, Urlar, Aberfeldy. Commended—Robert Peter, Urlar, Aberfeldy.

28. Heifers calved after 1st January 1866.—Premiums, L.8—L.4—and Medium Silver Medal. *1st.* The Duke of Athole, K.T., Blair Castle, Blair Athole. *2d.* John Malcolm of Poltalloch, Callton Mor, Lochgilphead. *3d.* John Malcolm of Poltalloch, Callton Mor, Lochgilphead. Commended—The Duke of Sutherland, K.G., Dunrobin Castle, Golspie.

AYRSHIRE.

29. Bulls calved before 1st January 1866.—Premiums, L.10—L.5—and Medium Silver Medal. Breeder of best Bull—Silver Medal. *1st.* William Buchanan, Coxithill, Stirling. *2d.* John Stewart, Burnside Cottage, Strathaven. *3d.* No award. Breeder of best Bull—William Buchanan, Coxithill, Stirling.

30. Bulls calved after 1st January 1866.—Premiums, L.20—L.10—and Medium Silver Medal. *1st,* Robert Wilson, Forehouse, Kilbarchan. *2d.* John Stewart, Burnside Cottage, Strathaven. *3d.* No award.

Section
31. Cows in Milk of any Age.—Premiums, L.15—L.8—and Medium Silver Medal. 1*st*. Robert Wilson, Forehouse, Kilbarchan. 2*d*. John Semple, Dumbarrow, Forfar. 3*d*. John Stewart, Burnside Cottage, Strathaven.
First Prize Cows at former Shows—Exhibited for Medium Gold Medal.
Inverness, 1865, when the property of the present Exhibitor—"Whitelegs." The Duchess Dowager of Athole, Dunkeld.
32. Cows in Calf of any Age.—Premiums, L.15—L.8—and Medium Silver Medal. 1*st*. Andrew Morton, Bickerton Hall, Whitburn. 2*d*. John Stewart, Burnside Cottage, Strathaven. 3*d*. Robert Wilson, Forehouse, Kilbarchan.
33. Heifers calved after 1st January 1866.—Premiums, L.10—L.5—and Medium Silver Medal. 1*st*. Robert Wilson, Forehouse, Kilbarchan. 2*d*. John Stewart, Burnside Cottage, Strathaven. 3*d*. John Stewart, Burnside Cottage, Strathaven.

FAT STOCK.

First Premium, Medium Gold Medal.
Second Premium, Silver Medal.
Third Premium, Medium Silver Medal.

34. Polled Oxen calved after 1st January 1865. 1*st*. William M'Combie, Tillyfour, Aberdeen. 2*d*. James Stephen, Conglass, Inverurie. 3*d*. James Skinner, Drumin, Ballindalloch. Commended—James Skinner, Mains of Craibstone, Auchmull, Aberdeen.
35. Polled Oxen calved after 1st January 1866.—1*st*. William M'Combie of Easter Skene, Aberdeen. 2*d*. William M'Combie, Tillyfour, Aberdeen. 3*d*. Robert Bruce, Newton of Struthers, Kinloss, Forres. Commended—William M'Combie, Tillyfour, Aberdeen.
36. Oxen of any Pure or Cross Breed calved after 1st January 1865.—1*st*. Thomas Ross, Hillhead, Forres. 2*d*. Richard H. Harris, Earnhill, Forres. 3*d*. John Frost, Delab, Monymusk. Commended—Robert Moir, Tarty, Ellon.
37. Oxen of any Pure or Cross Breed calved after 1st January 1866.—1*st*. Wishart and Wisely, Gallowgate, Aberdeen. 2*d*. William M'Combie, Tillyfour, Aberdeen. 3*d*. Robert Moir, Tarty, Ellon. Commended—George Shand, Ordens, Banff.
38. Highland Oxen calved after 1st January 1864.—1*st*. J. & W. Martin, New Market, Aberdeen. 2*d*. George and J. G. Smith, Minmore, Ballindalloch. 3*d*. The Duke of Sutherland, K.G., Dunrobin Castle, Golspie.
39. Highland Oxen calved after 1st January 1865.—1*st*. George and J. G. Smith, Minmore, Ballindalloch. 2*d*. Alexander Mitchell, Waterside, Slains, Newburgh, Aberdeen. 3*d*. Thomas Knowles, New Market, Aberdeen.
40. Cross Heifers calved after 1st January 1865.—1*st*. Robert Bruce, Newton o Struthers, Kinloss, Forres. 2*d*. James Reid, Graystone, Alford. 3*d*. James Skinner, Mains of Craibstone, Auchmull, Aberdeen.
41. Cross Heifers calved after 1st January 1866.—1*st*. Alexander Cowie, Cromley Bank, Ellon. 2*d*. Harry L. L. Morrison, Guise, Whitehouse, Aberdeen. 3*d*. J. and W. Martin, New Market, Aberdeen. Commended—James Bruce, Burnside, Fochabers.

EXTRA CATTLE.

The following were highly commended, and the Silver Medal was awarded to each:—Polled Ox, belonging to James Stephen, Conglass, Inverurie. Cross Ox, belonging to Walter Scott, Glendronach, Huntly.

The following were commended, and the Medium Silver Medal was awarded to each:—Polled Ox, belonging to Alexander Morison of Bognie, Turriff. Polled Ox, belonging to Alexander Morison of Bognie, Turriff. Polled Cow, belonging to Robert Walker, Montbletton, Banff. Cross Ox, belonging to J. & W. Martin, Aberdeen. Cross Ox, belonging to Harry L. L. Morrison, Guise, Aberdeen.

Class II.—HORSES

FOR AGRICULTURAL PURPOSES.

1. Stallions foaled before 1st January 1865.—Premiums, L.30—L.15—and Medium Silver Medal. Breeder of best Stallion—Silver Medal. 1*st*. James Hall, Frederick Street, Aberdeen. 2*d*. Murdo Bethune, Dreim, Beauly. 3*d*. John Thomson, Newton of Skene, Skene, Aberdeen. Commended—James Bennett, Balgray, Kirriemuir. Breeder of best Stallion—John Hanbury, Standground, Peterboro'.
2. Entire Colts foaled after 1st January 1865.—Premiums L.20—L.10—and Medium Silver Medal. 1*st*. Samuel Clark, Manswrae, Kilbarchan. 2*d*. John M'Donald, Duntocher. 3*d*. John Walker, Isaacstown, Keithhall. Commended—William Alexander, Airyhillock, Old Meldrum.

Section

3. Entire Colts foaled after 1st January 1866.—Premiums L.15—L.8—and Medium Silver Medal. *1st.* The Earl of Strathmore, Glamis Castle, Forfar. *2d.* Peter Beattie, Dunnydeer, Insch, Aberdeen. *3d.* William Wilson, Balquharn, Alford. Commended—Ainslie D. Ainslie, Delgaty Castle, Turriff.
4. Entire Colts foaled after 1st January 1867—Premiums, L.10—L.5—and Medium Silver Medal. *1st.* Joseph Tait, Brankananthem, Portsoy. *2d.* Alex. Milne, Corse of Kinnoir, Huntly. *3d.* The Earl of Strathmore, Glamis Castle, Forfar. Commended—David Milne, Blackhills, Nigg, Aberdeen.
5. Mares (with Foal at foot) foaled after 1st January 1865.—Premiums, L.20—L.10—and Medium Silver Medal. *1st.* Alexander Sim, Fawells, Keithhall. *2d.* Murdo Bethune, Dreim, Beauly. *3d.* Adam Gray, Harestone, Premnay, Insch, Aberdeen. Commended—William S. Marr, Upper Mill, Tarves.
6. Mares (in Foal) foaled before 1st January 1865.—Premiums, L.15—L.8—and Medium Silver Medal. *1st.* Alexander Milne, Corse of Kinnoir, Huntly. *2d.* Alexander Milne, Corse of Kinnoir, Huntly. *3d.* Andrew F. Williamson, Caskieben Mains, Blackburn, Aberdeen. Commended—Alexander Sim, Fawells, Keithhall.
7. Fillies foaled after 1st January 1865.—Premiums, L.10—L.5—and Medium Silver Medal. *1st.* John Kerr, Bloom, Mid Calder. *2d.* James Murray, Fauchfaulds, Turriff. *3d.* John Taylor, Presson, Coldstream. Commended—Robert Walker, Montbletton, Banff.
8. Fillies foaled after 1st January 1866.—Premiums, L.8—L.4—and Medium Silver Medal. *1st.* James Freeland, Broadgate, Strathblane. *2d.* The Duchess Dowager of Athole, Dunkeld. *3d.* Patrick Davidson of Inchmarlo, Aberdeen. Commended—James Wood, Midtown, Banff.
9. Fillies foaled after 1st January 1867.—Premiums, L.6—L.3—and Medium Silver Medal. *1st.* James Moir, Wardhouse, Insch, Aberdeen. *2d.* Thomas Milne, Newton of Ardoyne, Insch, Aberdeen. *3d.* William Riddell, Hillhead, Keithhall. Commended—James Sangster, Shielhill, Old Machar.

EXTRA SECTION.

10. Thorough-bred Stallions, to serve in the District.—Premium, L.100. *1st.* Robert Paterson of Birthwood, Biggar. Commended—The Earl of Seafield, Cullen House, Cullen; Robert Wilson, Lethenty, Alford.

EXTRA HORSES.

First Prize Pony Stallion at former Shows.—Exhibited for Medium Gold Medal. Inverness, 1865, when the property of the present Exhibitor—"Glentilt."—The Duke of Athole, K.T., Blair Castle.

The following were commended, and the Medium Silver Medal was awarded to each:

Roadsters: Gelding belonging to Alexander Brown, Knockolochie, Pitcaple. Gelding belonging to James Hay, jun., Little Ythsie, Tarves. Mare belonging to James Lumsden, Braco, Keith.

Ponies: Gelding belonging to James Dyce Nicol of Ballogie, M.P., Aboyne.

Class III.—SHEEP.

LEICESTER.

1. Tups not above 4 Shear—Premiums, L.10—L.5—and Medium Silver Medal. *1st.* George Thompson of Pitmedden, Aberdeen. *2d.* Lawrence Drew, Merryton, Hamilton. *3d.* John Hunter, Dipple, Fochabers. Commended—Adam Smith, Stevenson Mains, Haddington.
2. Dinmont or Shearling Tups—Premiums, L.10—L.5—and Medium Silver Medal. *1st.* David Ainslie of Costerton, Blackshiels. *2d.* Adam Smith, Stevenson Mains, Haddington. *3d.* The Earl of Southesk, Kinnaird Castle, Brechin. Commended—George Simson, Courthill, Kelso.
3. Ewes not above 4 Shear.—Premiums, L.8—L.4—and Medium Silver Medal. *1st.* Lawrence Drew, Merryton, Hamilton. *2d.* David Ainslie of Costerton, Blackshiels. *3d.* George Simson, Courthill, Kelso. Commended—Henry A. Rannie, Mill of Boyndie, Banff.
4. Shearling Ewes or Gimmers.—Premiums, L.8—L.4—and Medium Silver Medal. *1st.* George Simson, Courthill, Kelso. *2d.* David Ainslie of Costerton, Blackshiels. *3d.* George Torrance, Sisterpath, Dunse. Commended—John Lees, Marvingston, Haddington.

Section

CHEVIOT.

5. Tups not above 4 Shear.—Premiums, L.10—L.5—and Medium Silver Medal. 1*st*. Thomas Elliot, Hindhope, Jedburgh. 2*d*. James Brydon, Kinnelhead, Moffat. 3*d*. Thomas Elliot, Hindhope, Jedburgh. Commended—Thomas Elliot, Hindhope, Jedburgh.
6. Dinmont or Shearling Tups.—Premiums, L.10—L.5—and Medium Silver Medal. 1*st*. John Archibald, Glengelt, Lauder. 2*d*. Thomas Elliot, Hindhope, Jedburgh. 3*d*. John Archibald, Glengelt, Lauder. Commended—James Brydon, Kinnelhead, Moffat.
7. Ewes not above 4 Shear.—Premiums, L.8—L.4—and Medium Silver Medal. Best Pen of Lambs—Silver Medal. 1*st*. John Archibald, Glengelt, Lauder. 2*d*. Thomas Elliot, Hindhope, Jedburgh. 3*d*. John M'Gregor, Bellridding, Dumfries. Commended—James Brydon, Kinnelhead, Moffat. Best Pen of Lambs—Thomas Elliot, Hindhope, Jedburgh. Highly Commended—John Archibald, Glengelt, Lauder.
8. Shearling Ewes or Gimmers.—Premiums, L.8—L.4—and Medium Silver Medal. 1*st*. James Brydon, Kinnelhead, Moffat. 2*d*. Thomas Elliot, Hindhope, Jedburgh. 3*d*. John Archibald, Glengelt, Lauder. Commended—John M'Gregor, Bellridding, Dumfries.

BLACKFACED.

9. Tups not above 4 Shear.—Premiums, L.10—L.5—and Medium Silver Medal. 1*st*. John Archibald, Overshiels, Stow. 2*d*. Thomas Aitken, Listonshiels, Balerno. 3*d*. John Archibald, Overshiels, Stow. Commended—Thomas Murray, Eastside, Penicuik.
10. Dinmont or Shearling Tups.—Premiums, L.10—L.5—and Medium Silver Medal. 1*st*, 2*d*, and 3*d*. John Archibald, Overshiels, Stow. Commended—Thomas Murray, Eastside, Penicuik.
11. Ewes not above 4 Shear.—Premiums, L.8—L.4—and Medium Silver Medal. Best Pen of Lambs—Silver Medal. 1*st*. John Archibald, Overshiels, Stow. 2*d*. Allan C. Pagan, Innergeldie, Comrie. 3*d*. The Hon. Lady Menzies, Rannoch Lodge, Pitlochry. Best Pen of Lambs—John Archibald, Overshiels, Stow. Commended—Allan C. Pagan, Innergeldie, Comrie.
12. Shearling Ewes or Gimmers—Premiums, L.8—L.4—and Medium Silver Medal. 1*st*. John Malcolm, of Poltalloch, Callton Mor, Lochgilphead. 2*d*. John Inch, Mitchellhill, Biggar. 3*d*. John Archibald, Overshiels, Stow.

SOUTHDOWN.

13. Tups not above 4 Shear.—Premiums, L.10—L.5—and Medium Silver Medal. 1*st*. John Gordon of Parkhill, Aberdeen. 2*d*. Robert Scot Skirving, Camptoun, Drem. 3*d*. John Garland, Cairnton, Fordoun. Commended—William Keith, Netherton of Logie, Peterhead.
14. Ewes not above 4 Shear, or Gimmers.—Premiums, L.8—L.4—and Medium Silver Medal. 1*st*. Robert Scot Skirving, Camptown, Drem. 2*d*. Alexander Kinloch, yr. of Gilmerton, Drem. 3*d*. Sir William G. Gordon Cumming of Altyre, Bart., Forres. Commended—James Bruce, Burnside, Fochabers.

LONG-WOOLED OTHER THAN LEICESTER.

15. Tups not above 4 Shear.—Premiums, L.10—L.5—and Medium Silver Medal. 1*st* John Gibson, Woolmet, Dalkeith. 2*d*. Walter Reid, Drem. 3*d*. John Gibson. Woolmet, Dalkeith.
16. Ewes not above 4 Shear, or Gimmers.—Premiums, L.8—L.4—and Medium Silver Medal. 1*st*. Walter Reid, Drem. 2*d*. John Gibson, Woolmet, Dalkeith. 3*d* Walter Reid, Drem.

SHORT-WOOLLED OTHER THAN SOUTHDOWN.

17. Tups not above 4 Shear.—Premiums, L.10—L.5—and Medium Silver Medal. 1*st*. John Gibson, Woolmet, Dalkeith. 2*d*. The Earl of Strathmore, Glamis Castle, Forfar. 3*d*. The Earl of Strathmore, Glamis Castle, Forfar. Commended—The Earl of Strathmore, Glamis Castle, Forfar.
18. Ewes not above 4 Shear, or Gimmers.—Premiums, L.8—L.4—and Medium Silver Medal. 1*st*. The Earl of Strathmore, Glamis Castle, Forfar. 2*d*, John Gibson, Woolmet, Dalkeith. 3*d*. James Walker, Hillhead, St Andrews. Commended—The Earl of Strathmore, Glamis Castle, Forfar.

EXTRA SECTIONS.

Section

19. Cheviot Wethers not above 3 Shear.—Premiums, L.6—L.3—and Medium Silver Medal. 1*st.* Thomas Biggar, Chapelton, Dalbeattie. 2*d.* Richard Heath Harris Earnhill, Forres. 3*d.* James M'Gill, Rotchell, Dumfries.
20. Blackfaced Wethers not above 4 Shear.—Premiums, L.6—L.3—and Medium Silver Medal. 1*st.* William M'Combie, Tillyfour, Aberdeen. 2*d.* James Stewart New Market, Aberdeen. 3*d.* Andrew Wilson, Whiteside, Alford.
21. Cross-Bred Wethers not above 3 Shear.—Premiums, L.6—L.3—and Medium Silver Medal. 1*st.* James Stewart, New Market, Aberdeen. 2*d.* John Hunter, Dipple, Fochabers. 3*d.* Richard H. Harris, Earnhill, Forres. Commended—Lord Kinnaird, K.T., Rossie Priory, Inchture.

EXTRA SHEEP.

The following lot was highly commended, and the Silver Medal was awarded :—5 Tup and 5 Ewe Lambs (Shropshire Down), belonging to James Walker, Hillhead, St Andrews.

Class IV.—SWINE.

1. Boars, Large Breed.—Premiums, L.8—L.4—and Medium Silver Medal. 1*st.* Thomas D. Findlay, Easterhill, Glasgow. 2*d.* John Laing, Glendeuglie, Milnathort. 3*d.* James Dyce Nicol of Ballogie, M.P., Aboyne. Commended—R. E. Duckering & Sons, Northorpe, Kirkton Lindsey.
2. Boars, Small Breed—Premiums, L.8—L.4—and Medium Silver Medal. 1*st.* R. E. Duckering & Sons, Northorpe, Kirton Lindsey. 2*d.* and 3*d.* Thomas D. Findlay, Easterhill, Glasgow. Commended—David Robertson, Royal Hotel, Aberdeen.
3. Sows, Large Breed.—Premiums, L.6—L.3—and Medium Silver Medal. 1*st.* Thomas D. Findlay, Easterhill, Glasgow. 2*d.* James Skinner, Woodside, Aberdeen. 3*d.* R. E. Duckering & Sons, Northorpe, Kirton Lindsey. Commended—John Gash, 15 Mealmarket Street, Aberdeen.
4. Sows, Small Breed.—Premiums, L.6—L.3—and Medium Silver Medal. 1*st.* Thomas D. Findlay, Easterhill, Glasgow. 2*d.* R. E. Duckering & Sons, Northorpe, Kirton Lindsey. 3*d.* James Gordon of Manar, Inverurie. Commended—James Gordon of Manar, Inverurie.
5. Pens of 3 Pigs not exceeding 8 months old, Large Breed.—Premiums, L.4—L.2—and Medium Silver Medal. 1*st.* Thomas D. Findlay, Easterhill, Glasgow. 2*d.* R. E. Duckering & Sons, Northorpe, Kirton Lindsey. 3*d.* William Benton, Crookmore, Alford. Commended—James Skinner, Woodside, Aberdeen.
6. Pens of 3 Pigs not exceeding 8 months old, Small Breed.—Premiums, L.4—L.2—and Medium Silver Medal. 1*st.* Thomas D. Findlay, Easterhill, Glasgow. 2*d.* Robert Philp, Royal Hotel, Bridge of Allan. 3*d.* James Gordon of Manar, Inverurie. Commended—Edward Savage, Royal Lunatic Asylum, Aberdeen.

EXTRA SWINE.

The following was highly commended, and the Silver Medal was awarded :—Sow belonging to David Robertson, Royal Hotel, Aberdeen.

Class V.—POULTRY.

1st Premium—Silver Medal ; 2d Premium—Bronze Medal.

1. Dorking, Silver Grey—Cock and 2 Hens. 1*st.* John Duncan, Ardo, Methlic. 2*d.* John Allan, Crieffvechter, Crieff. Commended—James Simpson, Brigton, Durris, Aberdeen.
2. Dorking, Silver Grey—Cockerel and 2 Pullets. 1*st.* Thomas Raines, Bridgehaugh, Stirling. 2*d.* Peter Beattie, Dunnydeer, Insch, Aberdeen. Commended—William Ford, Hardengreen, Dalkeith.
3. Dorking, Coloured—Cock and 2 Hens. 1*st.* John Allan, Crieffvechter, Crieff. 2*d.* The Countess of Strathmore, Glamis Castle, Glamis. Commended—Wm. Meff, Ruthrieston, Aberdeen.
4. Dorking, Coloured—Cockerel and 2 Pullets. 1*st.* James Gordon of Manar, Inverurie. 2*d.* The Countess of Strathmore, Glamis Castle, Glamis. Commended—James Clark, Railway Station, Fochabers.
5. Dorking, White—Cock and 2 Hens.—No Entry.
6. Dorking, White—Cockerel and 2 Pullets.—No Entry.

Section

7. Cochin-China, Coloured—Cock and 2 Hens. 1*st*. John Stewart, Thistlebank, Helensburgh. 2*d*. William Meff, Ruthrieston, Aberdeen. Commended—B. C. Urquhart of Meldrum, Old Meldrum.
8. Cochin-China, Coloured—Cockerel and 2 Pullets. 1*st*. William Ford, Hardengreen, Dalkeith. 2*d*. John Stuart, Thistlebank, Helensburgh. Commended—Mrs Stronach, Sunnybank, Old Aberdeen.
9. Cochin-China, White—Cock and 2 Hens.—No Entry.
10. Cochin-China, White—Cockerel and 2 Pullets. 1*st*. William Ford, Hardengreen, Dalkeith.
11. Bramahpootra, Pencilled—Cock and 2 Hens. 1*st*. William Meff, Ruthrieston, Aberdeen. 2*d*. Thomas Raines, Bridgehaugh, Stirling. Commended—Mrs Farquharson of Invercauld, Braemar.
12. Bramahpootra, Pencilled—Cockerel and 2 Pullets. 1*st*. Keith Jopp, 13 Mount Street, Aberdeen. 2*d*. William Ford, Hardengreen, Dalkeith. Commended—Keith Jopp, 13 Mount Street, Aberdeen.
13. Bramahpootra, Light—Cock and 2 Hens. 1*st*. James Chalmers, Granton Lodge, Aberdeen. 2*d*. B. C. Urquhart of Meldrum, Old Meldrum.
14. Bramahpootra, Light—Cockerel and 2 Pullets.—No award.
15. Malay—Cock and 2 Hens.—No Entry.
16. Malay—Cockerel and 2 Pullets—No Entry.
17. Spanish—Cock and 2 Hens. 1*st*. William Meff, Ruthrieston, Aberdeen. 2*d*. Frederick M'Crae, 23 Albion Street, Aberdeen.
18. Spanish—Cockerel and 2 Pullets. 1*st*. William Meff, Ruthrieston, Aberdeen. 2*d*. Mrs Stronach, Sunnybank, Old Aberdeen.
19. Scotch Grey—Cock and 2 Hens. 1*st*. Robert Wilson, Forehouse, Kilbarchan. 2*d*. No Entry.
20. Scotch Grey—Cockerel and 2 Pullets. 1*st*. Robert Blair, Thornhill, Johnstone. 2*d*. No Entry.
21. Hamburg, Golden Pencilled—Cock and 2 Hens. 1*st*. Peter M'Robbie, jun., Sunnyside, Aberdeen. 2*d*. Mrs Farquharson of Invercauld, Braemar. Commended—Robert M'Gregor, Sunnybower, Perth.
22. Hamburg, Golden Pencilled—Cockerel and 2 Pullets. 1*st*. John Hay, jun., 19 Guestrow, Aberdeen. 2*d*. Mrs Farquharson of Invercauld, Braemar. Commended—Robert M'Gregor, Sunnybower, Perth.
23. Hamburg, Silver Pencilled—Cock and 2 Hens. 1*st*. B. C. Urquhart of Meldrum, Old Meldrum. 2*d*. William Clark, Cemetery Lodge, Aberdeen.
24. Hamburg, Silver Pencilled—Cockerel and 2 Pullets—No Entry.
25. Hamburg, Golden Spangled—Cock and 2 Hens. 1*st*. William Clark, Cemetery Lodge, Aberdeen. 2*d*. Mrs Stronach, Sunnybank, Old Aberdeen. Commended—Mrs Farquharson of Invercauld, Braemar.
26. Hamburg, Golden Spangled—Cockerel and 2 Pullets. 1*st*. James Still, Orchard Bank, Aberdeen. 2*d*. Mrs James Brown, Abercairney, Crieff.
27. Hamburg, Silver Spangled—Cock and 2 Hens. 1*st*. John Sharp, Canal Cottage, Johnstone. 2*d*. Mrs Stronach, Sunnybank, Old Aberdeen. Commended—B. C. Urquhart of Meldrum, Old Meldrum.
28. Hamburg, Silver Spangled—Cockerel and 2 Pullets. 1*st*. Joseph M. Campbell, Bonnykelly, New Byth. 2*d*. Mrs Robertson, Gordon Place, Dyce. Commended—James Still, Orchard Bank Cottage, Aberdeen.
29 Polish, White Crested Black—Cock and 2 Hens. 1*st*. Mrs Robertson, Gordon Place, Dyce. 2*d*. No Entry.
30. Polish, White Crested Black—Cockerel and 2 Pullets.—No Entry.
31. Polish, Golden Spangled—Cock and 2 Hens.—No Entry.
32. Polish, Golden Spangled—Cockerel and 2 Pullets.—No Entry.
33. Polish, Silver Spangled—Cock and 2 Hens. 1*st*. William M'Intosh, Ness, Nigg, Aberdeen. 2*d*. John Thom, Culsh, New Deer. Commended—Miss Ramsay of Barra, Aberdeen.
34. Polish, Silver Spangled—Cockerel and 2 Pullets.—No Entry.
35. Game, Black or Brown Reds—Cock and 2 Hens. 1*st*. Mrs Rennet, 13 Silver Street, Aberdeen. 2*d*. James M'Pherson, West North Street, Aberdeen. Commended—Frederick M'Crae, Albion Street, Aberdeen.
36. Game, Black or Brown Reds—Cockerel and 2 Pullets. 1*st*. Mrs Rennet, Silver Street, Aberdeen. 2*d*. Robert M'Gregor, Sunnybower, Perth.
37. Game, Duckwings—Cock and 2 Hens. 1*st*. James M'Pherson, North West Street, Aberdeen. 2*d*. No Entry.
38. Game, Duckwings—Cockerel and 2 Pullets.—No Entry.
39. Game, any other variety—Cock and 2 Hens.—No Entry.
40. Game, any other variety—Cockerel and 2 Pullets.—No Entry.
41. Bnatams, Game—Cock and 2 Hens. 1*st*. Robert M'Gregor, Sunnybower, Perth.

Section

2*d*. William Meff, Ruthrieston, Aberdeen. Commended—Sir George Macpherson Grant of Ballindalloch, Bart.

42. Bantams, Game—Cockerel and 2 Pullets. 1*st*. Thomas Raines, Bridgehaugh, Stirling. 2*d*. Joseph M. Campbell, Bonnykelly, New Byth. Commended—William Meff, Ruthrieston, Aberdeen.
43. Bantams, Gold-laced Sebright—Cock and 2 Hens. 1*st*. David Ainslie of Costerton, Blackshiels. 2*d*. No Entry.
44. Bantams, Gold-laced Sebright—Cockerel and 2 Pullets.—No Entry.
45. Bantams, Silver-laced Sebright—Cock and 2 Hens. 1*st*. David Ainslie of Costerton, Blackshiels. 2*d*. No Entry.
46. Bantams, Silver-laced Sebright—Cockerel and 2 Pullets.—No Entry.
47. Bantams, any other variety—Cock and 2 Hens.—No Entry.
48. Bantams, any other variety—Cockerel and 2 Pullets.—No Entry.
49. Any other distinct breed of Poultry—Cock and 2 Hens. 1*st*. B. C. Urquhart of Meldrum, Old Meldrum. 2*d*. B. C. Urquhart of Meldrum, Old Meldrum.
50. Any other distinct breed of Poultry—Cockerel and 2 Pullets. 1*st*. James Gordon of Manar, Inverurie. 2*d*. B. C. Urquhart of Meldrum, Old Meldrum.
51. Capons, of any Breed—3 Capons.—No Entry.
52. Ducks, White Aylesbury—Drake and 2 Ducks. 1*st*. Arthur Farquhar of Elsick, Stonehaven. 2*d*. Mrs Stronach, Sunnybank, Old Aberdeen.
53. Ducks, White Aylesbury—Drake and 2 Ducklings. 1*st*. Alexander Copland, Kintore. 2*d*. Mrs Stronach, Sunnybank, Old Aberdeen. Commended—John Sharp, Canal Cottage, Johnstone.
54. Ducks, Rouen—Drake and 2 Ducks. 1*st*. Arthur Farquhar of Elsick, Stonehaven. 2*d*. John Sharp, Canal Cottage, Johnstone.
55. Ducks, Rouen—Drake and 2 Ducklings. 1*st*. John Sharp, Canal Cottage, Johnstone. 2*d*. James Gordon of Manar, Inverurie.
56. Ducks, any other distinct Breed—Drake and 2 Ducks.—No Entry.
57. Ducks, any other distinct Breed—Drake and 2 Ducklings.—No Entry.
58. Turkeys, Black Norfolk—Cock and 2 Hens. 1*st*. Mrs Stronach, Sunnybank, Old Aberdeen. 2*d*. No Entry.
59. Turkeys, Black Norfolk—Cock and 2 Hens (Poults).—No Entry.
60. Turkeys, any other Breed—Cock and 2 Hens.—No Entry.
61. Turkeys, any other Breed—Cock and 2 Hens (Poults).—No Entry.
62. Geese, Grey Toulouse—Gander and 2 Geese.—No Entry.
63. Geese, Grey Toulouse—Gander and 2 Goslings. 1*st*. B. C. Urquhart of Meldrum, Old Meldrum. 2*d*. No Entry.
64. Geese, Embden—Gander and 2 Geese.—No Entry.
65. Geese, Embden—Gander and 2 Goslings. 1*st*. The Countess of Strathmore, Glamis Castle, Forfar. 2*d*. No Entry.

Class VI.—IMPLEMENTS.

On reports by the Local Committee for trying Implements and Machines, the Silver Medal was awarded to each of the following:—

Benjamin Reid & Co., Aberdeen, for Lever Drill.
George Sellar & Son, Huntly, for Zig-Zag Harrows.
J. Bisset & Sons, Blairgowrie, for Reaping Machine.
John Thomson, Aberdeen, for Three-horse lever Grubber.
William Rae, Bourtie, Old Meldrum, for Turnip Sowing Machine.

The following articles were highly commended:—

Chaff Cutters.—Benjamin Reid & Co,, Aberdeen.
Chaff Cutters.—Richmond & Chandler, Salford.
Horse Rake.—Benjamin Reid & Co., Aberdeen.
Knitting and Sewing Machines.—W. W. Kennedy, Edinburgh.
Oil Tester.—William Lincolne, Glasgow.
Reaping Machine.—Brigham & Bickerton, Berwick-on-Tweed.
Reaping Machine.—W. D. Brown, Mains of Turin, Forfar.
Reaper and Mower.—Lillie, Goodlet, Elder, & Co., Berwick-on Tweed.
Sharpening Machine.—Mitchell & Burgess, Manchester.
Turnwrist Plough.—John Blackhall, Ardgathen, Alford, Aberdeen.

The following were commended:—

Dressing Fans.—Thomas Clark, Craibstone, Auchmull, Aberdeen.
Corn Drills.—Benjamin Reid & Co., Aberdeen.
Fencing.—Benjamin Reid & Co., Aberdeen.
Fencing.—George W. Murray & Co., Banff.
Food-Cooling Barrows.—Kemp, Murray, & Nicholson, Stirling.

Horse-Hoe, Roller, and Rake, for Garden Walks.—Benjamin Reid & Co., Aberdeen.
Lamps and Lanterns.—James M'Leod, Turriff.
Pumps.—M'Cutcheon & Sons, Edinburgh.
Reaping and Mowing Machines.—J. & T. Young, Ayr.
Refrigerators.—Robert Hilton & Co., 31 Crichton Street, London.
Turnip Barrow.—Alexander Brodie, Dykeside, Auchterless, Turriff.
Whitechapel Cart.—James Davidson, Aberdeen.

LIST OF JUDGES.

Short-Horn.—L. C. Chrisp, Hawkhill, Alnwick; Joseph Culshaw, Towneley Park, Burnley; Andrew Mitchell, Alloa. Attending Members—Robert Simpson of Cobairdy, Huntly; Robert Copland, Mill of Ardlethen, Ellon.

Polled Angus or Aberdeen.—Robert Hector, Montrose; James Leslie, The Thorn, Blairgowrie; George Williamson, Shempston, Elgin. Attending Members—The Earl of Dalhousie, K.T.; Major Innes of Learney, Torphins; James Cochrane, Little Haddo, Foveran.

Polled Galloway.—Thomas Gibbons, Burnfoot, Esk, Longtown, Cumberland; A. C. Pagan, Innergeldie, Comrie; James Shennan, Balig, Kirkcudbright. Attending Members—Major Ramsay of Barra, Straloch, Aberdeen; Alexander Souter, Strocherie, Banff.

Highland.—John M'Arthur, Acurrach, Inverary; Duncan Mitchell, Blairvockie, Luss. Attending Members—Sir George Macpherson Grant of Ballindalloch, Bart.; George Cruickshank, Comisty, Huntly.

Ayrshire.—H. D. B. Hyslop, Tower, Sanquhar; Hugh Kirkwood, Killermont, Maryhill; John Waugh of St John's Kirk, Biggar. Attending Members—James Gordon of Manar, Inverurie; John Garland, Cairnton, Fordoun.

Fat Stock and Extra Cattle.—Stewart Johnston, Perth; David Smith, Leyshead, Dundee; Thomas Gibbons, Burnfoot, Esk, Longton. Attending Members—Colonel M'Inroy of The Burn, Brechin; James Lumsden, Braco, Keith.

Draught Horses.—John Dickson, Saughton Mains, Edinburgh; Alexander Young, Keir Mains, Dunblane; John Young, Fulwood, Houston. Attending Members—Sir Walter Elliot of Wolfelee, K.S.I., Hawick; Charles Lyall, Old Montrose, Montrose.

Thorough-bred and Extra Horses.—George A. Grey, Millfield Hill, Wooler; Nicol Milne of Faldonside, Melrose. Attending Members—Harry L. L. Morrison of Blair, Whitehouse; Silvester Campbell, Kinellar, Blackburn.

Leicester, Long-Woolled, Cross-bred Wethers, and Extra Sheep.—William Purves, Linton Burnfoot, Kelso; John Wilson, Edington Mains, Chirnside. Attending Members—Sir James H. Burnett of Leys, Bart.; Arthur Glennie, Fernyflatt, Bervie.

Cheviot.—William Henderson, Langleeford, Wooler; John Scott, Drynoch, Broadford, Skye; William Thompson, Ryle, Alnwick. Attending Members—D. R. Lyall Grant of Kingsford, Alford; James Wood, Provost of Banff.

Blackfaced.—James Coubrough, Blairtummoch, Campsie; George Howison, Runnagulzion, Blairgowrie; Donald M'Intyre, Tignablair, Comrie. Attending Members—David Lyall of Gallery, Montrose; Alexander Forbes Douglass, Haddo House, Methlic.

Southdown and other Short Woolled.—George A. Grey, Millfield Hill, Wooler; G. A. Thomson, Farlm Hall, Carlisle. Attending Members—Alexander Stuart of Laithers, Turriff; Alexander Bowie, Mains of Kelly, Arbroath.

Swine.—James Deans, Dalkeith Park, Dalkeith; A. C. Pagan, Innergeldie, Comrie; James Shennan, Balig, Kirkcudbright. Attending Members—Sir James D. H. Elphinstone of Logie-Elphinstone, Bart.; George Gordon, Tullochallum, Craigellachie.

Poultry.—Henry Curtis, Grant Lodge, Elgin; John Gibson, Woolmet, Dalkeith; David Stratron, Edinburgh. Attending Members—James Dyce Nicol of Ballogie, M.P., Aberdeen; James W. Barclay, Auchlossan, Aberdeen.

Implements.—Professor Macquorn Rankine, Consulting Engineer to the Society; John Gibson, Woolmet, Dalkeith, Chairman of the Society's Machinery Committee; Alexander Slight, Edinburgh, Practical Engineer to the Society: Robert Elliot, Laighwood, Dunkeld; William Goodlet, Bolshan, Arbroath; Thomas Mylne, Niddrie Mains, Liberton; John Ord of Muirhouselaw, Nisbet, Kelso; Thomas Park, Stoneyhill, Musselburgh.

Local Committee on Implements.—James Abernethy, C.E., Aberdeen; Alexander Campbell, Blairton, Belhelvie; James Porter, Monymusk, Aberdeen; Major Ramsay of Barra, Straloch, Aberdeen; Robert Walker, Portlethen, Aberdeen. Major Ramsay, Convener of Local Committee.

III.—DISTRICT COMPETITIONS.

CATTLE.

District of Strontian.

BULLS, . .	Alexander Maclean of Ardgour, Fort-William, .	Silver Medal.
BULLS, Class I.,†	1. John Robertson, Glencrippesdale, Morven, .	L.3 10 0*
	2. A. Kirkpatrick, Drimnatorin, Strontian, . .	2 0 0*
BULLS, Class II.,‡	Donald Macvean, Salachan, Ardgour, . . .	3 0 0*
HEIFERS, . .	1. Donald Macvean, Salachan, Ardgour, . .	5 0 0
	2. John Robertson, Glencrippesdale, Morven, .	3 0 0

District of Kintyre.

BULLS, . .	Robert Dickie, Kileonan, Campbeltown, . .	Silver Medal.
BULLS, Class I., .	1. Robert Dickie, Kileonan, Campbeltown, . .	L.7 0 0
	2. James Greenlees, Moy, Campbeltown, . .	4 0 0
BULLS, Class II.,	John Russell, Tirfergus, Campbeltown, . .	6 0 0
HEIFERS, . .	1. Robert Dickie, Kileonan, Campbeltown, . .	5 0 0
	2. William Stewart, Tonrioch, Campbeltown, .	3 0 0

County of Dumbarton.

BULLS, Class I., .	1. George Kinloch, Garshake, Dumbarton, . .	L.3 10 0*
	2. Duncan Macfarlane, Torr, Row, . . .	2 0 0*
BULLS, Class II.,	James M'Connochie, Nether Ross, Helensburgh, .	3 0 0*
HEIFERS, . .	1. John Houston, Geilston, Cardross, . . .	5 0 0
	2. Duncan Macfarlane, Torr, Row, . . .	3 0 0

District of Nithsdale.

BULLS, Class I., .	1. James Hewetson, Auchenbenzie, Thornhill, .	L.7 0 0
	2. Abram Kerr, Castlehill, Thornhill, . . .	4 0 0
BULLS, Class II.,	James and Thomas Smith, Glenmanna, Thornhill,	6 0 0
HEIFERS, . .	1. Thomas Brown, Holm, Thornhill, . . .	5 0 0
	2. Thomas Brown, Holm, Thornhill, . . .	3 0 0

Islands of Shetland.

BULL, . . .	Charles G. Duncan, Lerwick, ...	Silver Medal.

District of Annandale.

HEIFER, . .	John Graham of Shaw, Lockerbie, . . .	Silver Medal.

County of Elgin.

BULL, . .	George Brown, Westerton, Fochabers, . .	Silver Medal.

County of Nairn.

BULL, . .	Robert Fraser, Brackla, Nairn, ...	Silver Medal.

DRAUGHT HORSES.

County of Ayr.

STALLIONS, . .	David Riddell, Kilbowie, Duntocher, . . .	L.25 0 0
MARES, . .	J. N. Fleming of Knockdon, Maybole, . . .	10 0 0
FILLIES, . .	John Lockhart, Kirminnoch, Kirkcolm, . .	5 0 0

ENTIRE COLTS.

County of Lanark.

2-YEAR OLD COLTS,	The Countess of Home, Bothwell Castle, Bothwell,	L.6 0 0
1-YEAR OLD COLTS,	Robert Black, Easterhouse, Baillieston, . .	2 0 0*

District of Wester Ross.

1-YEAR OLD COLTS,	Robert Trotter, Garguston, Killearnan, . .	L.4 0 0

* Half Premiums awarded, the number of lots being under six.
† Class I., Bulls calved before 1st January 1866.
‡ Class II., Bulls calved after 1st January 1866.

District of Perth, Fife, Kinross, and Clackmannan.

Stallions, . .	David Riddell, Kilbowie, Duntocher, . . .	L.10 0 0

LEICESTER SHEEP.

County of Edinburgh.

Tups, . . .	The Duke of Buccleuch, K.G., Dalkeith, . .	Silver Medal.
Tups, . . .	John Ainslie, Hillend, Roslin, ...	L.2 10 0*
Shearling Tups,	David Ainslie of Costerton, Blackshiels, . .	5 0 0
Ewes, ...	David Ainslie of Costerton, Blackshiels, . .	2 10 0*
Shearling Ewes,	David Ainslie of Costerton, Blackshiels, . .	2 0 0*

County of Forfar.

Tup, . . .	Colonel Dempster of Dunnichen, Forfar, . .	Silver Medal.

District of the Border Union Society.

Tup, . . .	Rev. R. W. Bosanquet, Rock, Alnwick, . .	Silver Medal.

CHEVIOT SHEEP.

Districts of Mull, Coll, and Tyree.

Tups, . . .	Walter Elliot, Scour, Achnacraig, Mull, . .	Silver Medal.
Tups, . . .	Walter Elliot, Scour, Achnacraig, Mull, . .	L.5 0 0
Shearling Tups,	Ebenezer B. Thorburn, Isle of Muck, Tobermory,	5 0 0
Ewes, ...	Ebenezer B. Thorburn, Isle of Muck, Tobermory,	5 0 0
Shearling Ewes,	Ebenezer B. Thorburn, Isle of Muck, Tobermory,	4 0 0

Districts of Eskdale and Liddesdale.

Tups, . . .	James Brydon, Kinnelhead, Moffat, . . .	Silver Medal.
Tups, . . .	James Brydon, Kinnelhead, Moffat, . . .	L.5 0 0
Shearling Tups,	James Brydon, Kinnelhead, Moffat, . . .	5 0 0
Ewes, ...	James Brydon, Kinnelhead, Moffat, . . .	5 0 0
Shearling Ewes,	James Brydon, Kinnelhead, Moffat, . . .	4 0 0

Pastoral District of Ross-shire.

Tup, . . .	Captain Davidson, Inverbroom, ...	Silver Medal.

County of Sutherland.

Tup, . . .	William Mitchell, Ribigill, Tongue, . . .	Silver Medal.

BLACKFACED SHEEP.

Upper Ward of Lanarkshire.

Tups, . . .	John Wilson, Nunnerie, Abington, . . .	Silver Medal.
Tups, . . .	David Tweedie, Castle Mains, Crawford, Abington,	L.5 0 0
Shearling Tups,	Mrs Watson, Nisbet, Biggar, ...	5 0 0
Ewes, . . .	Gavin Sandilands, Netherhouse, Lesmahagow, .	5 0 0
Shearling Ewes,	David Tweedie, Castle Mains, Crawford, . .	4 0 0

District of Argyll.

Tups, . . .	James Campbell, Ormaig, Lochgilphead, . .	L.5 0 0
Shearling Tups,	James Campbell, Ormaig, Lochgilphead, . .	5 0 0
Ewes, . . .	George Campbell, Ardifair, Lochgilphead, . .	5 0 0
Shearling Ewes,	James Campbell, Ormaig, Lochgilphead, . .	4 0 0

District of Lorn.

Tups, . . .	John Eccles, Melfort, Oban, ...	Silver Medal.
Tups, . . .	Duncan M'Callum, Clanmackrie, Oban, . .	L.2 10 0*
Shearling Tups,	Duncan M'Callum, Clanmackrie, Oban, . .	2 10 0*
Ewes, . . .	John M'Farlan, Barnacairy, Oban, . . .	2 10 0*
Shearling Ewes,	Dugald Clerk, Duntanachan, Bunaw, . . .	4 0 0

Districts of Athole and Weem.

Tup, . . .	Sir Robert Menzies of Menzies, Bart., . . .	Silver Medal.

* Half Premiums awarded, the number of lots being under six.

DAIRY PRODUCE.

District of Lorn.

CURED BUTTER, .	1. John M'Innes, Achnaba, Bunawe, . . .	L.3	0 0
	2. Daniel Bain, Dunstaffnage, Oban, . . .	2	0 0

District of Kilmarnock.

Medium Gold Medals were awarded to—
1. John M'Camon, Barnhills, Stranraer, for best Cheddar Cheese.
2. William Lindsay, Killoch, Mauchline, for best Dunlop Cheese.

SEED COMPETITIONS.

In the course of the year 1868, 31 Medium Silver Medals were awarded at 12 Seed Competitions, the details of which are given at page 124.

PLOUGHING COMPETITIONS.

In the course of the year 1867-68, the Society's Silver Plough Medal was awarded at 167 Ploughing Competitions, the details of which are given at page 125–8.

REAPING-MACHINE COMPETITIONS.

The Medium Silver Medal was awarded to John Sellar, Hatton, Kinloss, as the servant found most expert at a trial of Reaping-Machines held at Sweethillock, Alves, on the 8th of August 1868.

MEDALS IN AID OF PREMUIMS GIVEN BY LOCAL SOCIETIES.

Medium Silver Medals were awarded to the following :—

COUNTY OF ABERDEEN.

Cluny Association.

William Downie, Mains of Linton, Cluny, for best managed Farm.
Colonel Charles Fraser of Castle Fraser, for best managed Green Crop.

Donside Club.

George Thompson, of Pitmedden, Dyce, for best managed Green Crop.

Leochel-Cushnie.

William M'Combie of Lynturk, Whitehouse, for best managed Green Crop.

COUNTY OF ARGYLL.

Inveraray Society.

Charles Turner, Maum, Inveraray, for best Highland Bull.
John M'Arthur, Barbreck, Lochgilphead, for best Highland Cow.

Kilfinan Society.

Robert Crawford, Ardgadden, Tigh-na-bruaich, for best Highland Bull.
Donald Fletcher, Inveryne, Tigh-na-bruaich, for best Highland Cow.

COUNTY OF AYR.

Ardrossan Society.

Andrew Allan, Munnoch, Dalry, for best Sweet Milk Cheese.
William Smith, Corsankell, Stevenston, for best Cured Butter.

Cumnock Society.

R. & P. Wardrope, Garlaff, Cumnock, for best Ayrshire Bull.
James Murray, Muir, Cumnock, for best Ayrshire Cow.
William Stewart, Daleagles, New Cumnock, for best Sweet Milk Cheese.
Mrs Murray, Donaldson Braes, Cumnock, for best Cured Butter.
Robert Baird, Watston, Ochiltree, for best collection of Seeds.
Robert Baird, Watston, Ochiltree, for best collection of Roots.

Galston Society.

James Cameron, Knowe, Newmilns, for best Ayrshire Bull.
William Wright, Meikleyard, Galston, for best Ayrshire Cow.

Kilmarnock Club.

Hugh Woodburn, Annandale, Kilmarnock, for best managed Farm.
James Clelland, Knockenlaw, Kilmarnock, for best managed Green Crop.
Robert Drummond, Pocknave, Craigie, for best managed Dairy.

Mauchline Society.

Mrs Robert Armour, Stairaird, Barskimming, for best managed Dairy.
William Weir, Westown, Sorn, for best Cured Butter.

Sorn Society.

James Weir, Blackside, Sorn, for best Ayrshire Bull.
Robert Brown, Dalgain, Sorn, for best Ayrshire Cow.
David Shaw, Blackdyke, Sorn, for best kept Fences.
William Sloan, Crofthead, Sorn, for best Sweet Milk Cheese.
James Baird, Blindburn, Sorn, for best Cured Butter.

Stewarton Society.

Robert Stevenson, Gillmill, Stewarton, for best Ayrsbire Bull.
A. R. Foulds, of Clerkland, Stewarton, for best Ayrshire Cow.
Andrew Picken, Glessick, Fenwick, for best Sweet Milk Cheese.

Tarbolton Society.

Matthew Allan, Auchinweet, Tarbolton, for best Sweet Milk Cheese.

West Kilbride Society.

Thomas Barbour, Kilrusken, West Kilbride, for best Ayrshire Cow.
John Crawford, Millstonford, West Kilbride, for best Leicester Ewe.
Alexander Young, Yonderton, West Kilbride, for best Sweet Milk Cheese.

COUNTY OF BUTE.

Bute Society.

Robert M'Fie, Nether Ettrick, North Bute, for best managed Green Crop.

Arran Society.

Thomas Miller, Glensannox, Brodick, for best Blackfaced Tup.
James Allan, jun., Clauchan, Brodick, for best Blackfaced Gimmer.

COUNTY OF CAITHNESS.

Caithness Society.

James Henderson of Bilbster, Wick, for best Short-horn Bull.
James Henderson of Bilbster, Wick, for best Short-horn Cow.

COUNTY OF CLACKMANNAN.

Clackmannan Society.

William Menzies, Inch, Kincardine-on-Forth, for best managed Green Crop—Carse farm.
Walter Wylie, Parkhead, Alloa, for best managed Green Crop—Dryfield farm.
Matthew Edwards, Hilton, Alloa, for best managed Hay Crop.

COUNTY OF DUMFRIES.

Nithsdale Society.

William Borland, Townfoot, Thornhill, for best Sweet Milk Cheese.
Oswald Crawford, Auchingassel, Thornhill, for best Cured Butter.

Sanquhar Society.

William Kennedy, Kirkland, Kirkconnel, for best Ayrshire Bull.
James Moffat, Gateside, Sanquhar, for best Ayrshire Cow.
Archibald Campbell Bramwell, Blackaddie, for best Sweet Milk Cheese.
Mrs Bramwell, Blackaddie, for best Cured Butter.

County of Edinburgh.

Penicuik Society.

John Ainslie, Hillend, Loanhead, for best Leicester Tup.
Executors of the late James Henderson, Auchincorth, Penicuik, for best Blackfaced Ewe.

Western District of Mid-Lothian Society.

Robert M. Buchanan, Livingstone Mill, Mid-Calder, for best Clydesdale Mare.

County of Elgin.

Forres and Northern Fat Cattle Club.

Richard Heath Harris, Earnhill, Forres, for best Fat Ox.
William Rose, Sheriffston, Elgin, for best Fat Cow.
John Hunter, Dipple, Fochabers, for best Pen of Fat Sheep.
James Lawrence, Mills, Forres, for best Fat Pig.
Sir William Gordon Cumming of Altyre, Bart., for best collection of Roots.

Morayshire Farmers' Club.

James Bruce, Burnside, Fochabers, for best Swedish Turnips.
James Macpherson, Pitcroy, Ballindalloch, for best Potatoes.

Spey, Avon, and Fiddochside Society.

James Skinner, Drumin, Ballindalloch, for best Polled Bull.
James Skinner, Drumin, Ballindalloch, for best Polled Heifer.
James Skinner, Drumin, Ballindalloch, for best managed Farm.
George Smith, Minmore, Ballindalloch, for best managed Green Crop.

County of Inverness.

Northern Counties Fat Show Club.

The Duke of Sutherland, K.G., Dunrobin Castle, Golspie, for best Fat Ox.
William Brown, Moraystone, Petty, for best Fat Heifer.
George Middleton, Corntown, Dingwall, for best pen of Fat Sheep.
John Hendrie, Castle Heather, Inverness, for best Fat Pig.

County of Kincardine.

Kincardineshire Club.

James C. Thom, Quithilhead, Durris, for best managed Green Crop.

Fettercairn Club.

Charles Durward, Eagle Inn Farm, Fettercairn, for best managed Green Crop.

County of Lanark.

Avondale Society.

John Fleming, Meadowbank, Strathaven, for best Ayrshire Bull.
John Stewart, Crosshill, Strathaven, for best Ayrshire Cow.

Cadder Society.

Robert M'Kean, Lumloch, Bishopbriggs, for best Ayrshire Bull.
Robert M'Kean, Lumloch, Bishopbriggs, for best Clydesdale Mare.

Hutchesontown Gardens, Glasgow.

Robert Boness, Glasgow, for best kept Flower-Plot.

Victoria Gardens, Govanhill, Glasgow.

James Thomas, Glasgow, for best kept Flower-Plot.

County of Linlithgow.

Whitburn Society.

Andrew Morton, Bickerton, Whitburn, for best Ayrshire Bull.
John Meikle, Seafield, Bathgate, for best Ayrshire Cow.

County of Nairn.

Nairnshire Society.

David Macbean, Nairnside, Cawdor, for best managed Farm.

County of Orkney.

Shetland Society.

James Jaffray, Belmont, Unst, for best Sweet Milk Cheese.
James Jaffray, Belmont, Unst, for best Cured Butter.

County of Peebles.

Broughton Society.

John Ritchie, Gladstone, Biggar, for best Cured Butter.

West Linton Society.

Mrs David Greenshiels, Fairniehaugh, Noblehouse, for best Sweet Milk Cheese.
Mrs William Hall, Linton Cottage, West Linton, for best Cured Butter.

County of Perth.

Middle District of Athole and Tullymet Association.

Donald Ferguson, Dalcapon, Ballinluig, for best managed Green Crop.

Weem and Breadalbane.

Charles Paterson, Camserney, Aberfeldy, for best Amateurs' Garden.

County of Ross.

Black Isle Society.

Donald John MacRae, Tullich, Munlochy, for best Short-horn Bull.
Mrs Major Wardlaw, Belmaduthy, Munlochy, for best Short-horn Cow.

Wester Ross Club.

John Gordon, Braelangwell, Poyntzfield, for best Short-horn Bull.
David Ross, banker, Dingwall, for best Clydesdale Mare.

County of Wigtown.

Kirkmaiden Society.

Peter M'Cosh, Cairngaurn, Kirkmaiden, for best Ayrshire Bull.
Charles M'Intyre, Curghie, Kirkmaiden, for best Ayrshire Cow.

IV.—COTTAGES AND GARDENS.

FOR THE BEST-KEPT COTTAGES AND GARDENS.

First Cottage Premium, L.1, 5s., and Medal when Four Competitors; Second, L.1; Third, 15s. First Garden Premium, L.1, 5s., and Medal when Four Competitors; Second, L.1; Third, 15s.

County of Aberdeen.

Lonmay and Crimond.—1*st* Cottage Premium and Medal, George Craighead; 2*d*, Alexander Sinclair; 3*d*, Alexander Watson. 1*st* Garden Premium and Medal, James Ewerdine; 2*d*, Andrew Findlay; 3*d*, James Smith. Medal to Robert Ritchie, awarded 1*st* Premium last year.

Tarland and Cromar.—1*st* Cottage Premium and Medal, John Farquhar; 2*d*, William Emslie; 3*d*, William Skene. 1*st* Garden Premium and Medal, William Emslie; 2*d*, Charles Gordon; 3*d*, John Cumming.

County of Edinburgh.

Balerno and Currie.—1*st* Garden Premium and Medal, George Heriot; 2*d*, John Anderson; 3*d*, William Aitken. Medal to James Bryce, awarded 1*st* Prize last year.

County of Lanark.

Bothwell.—1*st* Garden Premium and Medal, Alexander Greenhorn; 2*d*, John M'Farlan; 3*d*, David Martin.

County of Perth.

Forgandenny.—1*st* Garden Premium and Medal, Thomas M'Ewan; 2*d*, William Edwards; 3*d*, John Richardson. Medal to James Anderson, awarded 1*st* Prize in 1867.

Gask.—1*st* Cottage Premium and Medal, Mary Monerieff; 2*d*, James Kemp; 3*d*, James M'Arthur. 1*st* Garden Premium and Medal, Donald Christie; 2*d*, Robert Monteith; 3*d*, James Donaldson.

MEDALS GIVEN IN AID OF PRIVATE COMPETITIONS.

Silver Medals were awarded to the following:—

Ballindalloch.—John Beattie, for best kept Cottage.

Culross.—John Ferguson, for best kept Cottage Garden.

Dunning.—James Marshall, for best kept Cottage Garden.

Logiealmond and Glenalmond.—James Taylor, for best kept Cottage; Allan Stewart, for best kept Cottage Garden.

Weem and Breadalbane.—Mrs Stevens, for best kept Cottage; Robert Douglas, for best kept Cottage Garden.

West Linton.—Thomas Inglis, for best kept Cottage; Thomas Inglis, for best kept Cottage Garden.

V.—EDINBURGH CHRISTMAS CLUB.

Vote in aid of Premiums, ... L.50

VI.—VETERINARY COLLEGE.

Silver Medals were awarded, at the Annual Examination in April last, to the following:—

1. Jonathan Bunnell, Liverpool, for best Examination in Horse Pathology.
2. Andrew Spreull, Milngavie, for best Examination in Anatomy.
3. Do. do. for best Examination in Physiology.
4. Joseph L. Faulkner, Wetherby, for best Examination in Materia Medica.
5. Frederick W. Going, Mullenahone, for best Examination in Chemistry.
6. George Lawson, Aberdeen, for best General Examination.

VII.—AGRICULTURAL CLASS, EDINBURGH UNIVERSITY.

The Prizes of L.6 and L.4, annually allowed by the Society to the Students who pass the best and second best examinations in the Agricultural Class in the University of Edinburgh, were awarded in 1868 to—1*st*, G. R. Glendinning, Mid-Lothian; 2*d*, G. G. Bursby, Northumberland.

RETURNS OF SEED COMPETITIONS HELD IN 1868.

Districts.	Seed exhibited in Competition.		Number of Competitors.	Competitors to whom Medium Silver Medals were Adjudged.	Produce per Imperial Acre.	Weight per Bushel.	Date of Sowing.	Date of Reaping.	Ground on which the Prize Seed was Grown.		
	Name of Species and Varieties.	Quantity.							Altitude	Exposure	Nature of Soil.
		Qrs.			Qrs.	Lbs.			Feet.		
Caithness,	Bere,	3	5	William Laing, Skaill, Thurso,	$5\frac{1}{2}$	54	May 3, 1867	Sept. 20,1867	150	S.E.	Dark loam on clay slate.
	Potato Oats,	3	6	William Bain, Isauld, Thurso,	5	$45\frac{1}{2}$	Apr. 26, ,,	Sept. 26, ,,	60	W.	Sandy loam.
Shetland,	Providence Oats,	2	9	John Anderson, Queendale, Lerwick,	4	$41\frac{1}{2}$	Apr. 2, ,,	Sept. 26, ,,	20	E.	Various.
	Bere,	2	3	Arthur Smith, Islesburgh Brae, Lerwick,	3	$51\frac{1}{2}$	Apr. 25, ,,	Sept. 14, ,,	80	N.E.	
	Perennial Ryegrass,	$1\frac{1}{2}$		Andrew Umphray, of Reawick, Lerwick,	3	$22\frac{1}{2}$	Apr. 22, 1866	July 20, ,,	50	S.E.	
Spey, Avon, &c.	Barley (golden melon)	3	3	James M'Pherson, Pitcroy, Ballindalloch,	$5\frac{1}{2}$	57	Apr. 27, 1867	Sept. 17, ,,	407	S.	Light gravelly.
	Oats (Scotch birlie)	3	6	James M'Pherson, Pitcroy, Ballindalloch,	$4\frac{1}{2}$	46	Apr. 27, ,,	Sept. 20, ,,	420	S.	
Strathearn,	Potato Oats,	3	8	John White, Muirhead, Dunning,	$4\frac{3}{4}$	$44\frac{1}{2}$	Apr. 10, ,,	Sept. 17, ,,	160	N.	Till and gravel.
Strathspey,	Oats (early Angus)	3	2	Charles Grant, Advie, Advie,	5	$45\frac{1}{4}$	Apr. 10, ,,	Sept. 4, ,,	650	S.	Loamy soil.
	Barley,	3	2	James MacGregor, Balmenach, Cromdale,	$4\frac{1}{2}$	$55\frac{1}{2}$	Apr. 17, ,,	Sept. 3, ,,	700	S.W.	
Elgin,	Wheat,	3	3	John Hunter, Dipple, Fochabers,	5	65	Oct. 23, 1866	Sept. 12, ,,	70	S.	Clay loam.
	Chevalier Barley,	3	3	John Brown, Findrassie, Elgin,	5	$58\frac{1}{2}$	Apr. 7, 1867	Sept. 15, ,,	36	N.	
	Potato Oats,	3	3	John Hunter, Dipple, Fochabers,	4	46	Apr. 1, ,,	Sept. 7, ,,	80	S.	Black loam.
	Perennial Ryegrass,	2	6	James M'Pherson, Pitcroy, Ballindalloch,	3	37	Apr. 15, ,,	Aug. 20, ,,	420	S.	
Stirling,	Barley,	3	4	Peter Dewar, King's Park, Stirling,	$4\frac{1}{2}$	$55\frac{1}{2}$	Apr. 6, ,,	Sept. 14, ,,	50	S.	Dry field.
	Sandy Oats,	3	17	William Carrick, Baad, Stirling,	$6\frac{1}{2}$	$43\frac{1}{2}$	Apr. 3, ,,	Sept. 14, ,,	30to35	Flat	Stiff clay.
	Beans,	3	5	William Carrick, Baad, Stirling,	4	$66\frac{3}{4}$	Apr. 26, ,,	Sept. 17, ,,	20to25	S.	Alluvial.
	Tares,	1	2	George Neilson, Cobble Brae, Falkirk,		62	Feb. ,,	Sept. ,,	10	Flat.	Heavy soil.
	Wheat (Hunter's)	3	11	William Carrick, Baad, Stirling,	$6\frac{1}{2}$	$64\frac{1}{2}$	Nov. ,,	Aug. 1868	30	S.	Stiff clay.
Dalkeith,	Chevalier Barley,	10	6	John Gibson, Woolmet, Dalkeith,	7	57	Mar. 14, ,,	Sept. 3,1867	200	S.	Gravelly.
	Providence Oats,	10	5	James Wilson, Wester Cowden, Dalkeith,	$7\frac{3}{4}$	$42\frac{3}{4}$	Mar. 31, ,,	Sept. 10, ,,	400	N.	
	Granton Beans,	5	2	James Wilson, Wester Cowden, Dalkeith,	$5\frac{1}{2}$	66	Mar. 5,6, ,,	Sept. 19, ,,	300	N.	Clay loam.
	Wheat (Oxford prize)	8	7	David Denholm, Caldcoats, Musselburgh,	6	$64\frac{3}{4}$	Feb. 24, 1868	Aug. 18,1868	200	N.	Free soil.
Glen Urquhart, Banff and Turriff.	Sandy Oats,	3	8	A. Edmonston, Polmaily, Drumnadrochit,	$4\frac{3}{4}$	$48\frac{1}{4}$	Apr. 5, 1867	Sept. 12,1867	120	S.	Light loam.
	Barley (golden melon)	3	7	Robert Turner, Arradoul, Buckie,	5	$58\frac{1}{2}$	Apr. 19, ,,	Sept. 9, ,,	200	N.	Black loam.
	Sandy Oats,	3	18	John Barclay, Braes of Enzie, Fochabers,	$5\frac{1}{2}$	46	Mar. 29, ,,	Sept. 19, ,,	350	N.	
Wester Ross.	Barley,	2	3	Alexander Allan, Drummond, Evanton,	5	$57\frac{1}{2}$	Apr. 25, ,,	Sept. 11 ,,	40	S.	Dark heavy mould.
	Oats,	2	3	William Laing, Ussie, Dingwall,	$5\frac{3}{4}$	44	Apr. 6, ,,	Oct. 8, ,,	430	S.	Clay loam.
	Ryegrass,	1	3	Murdo Bethune, Drem, Beauly,	2	31	Apr. 15, ,,	July 20, ,,	350	S.	Black mould.
Black Isle.	Chevalier Barley,	3	4	Donald Mackay, Kessock, Inverness,	4	59	Apr. 9, ,,	Aug. 10, ,,	20	S.	Gravelly.
	Potato Oats,	3	4	Donald Mackay, Kessock, Inverness,	5	$46\frac{3}{4}$	Apr. 5, ,,	Aug. 5, ,,	200	S.	

PLOUGHING COMPETITIONS REPORTED TO THE SOCIETY IN 1867–68.

ABERDEENSHIRE.

No.	*Name of Society.*	*Place of Competition.*	*Silver Medal awarded to.*
1.	Vale of Alford.	Dorsell.	John Leonard, Carnaveron.
2.	Ballater.	Dorseensilly.	Thomas Simmers, Ballater.
3.	Buchan (Deer District).	Mains of Gaval.	John Anderson, Strichen Mains.
4.	Buchan (Fraserburgh Dist.).	Kinbog.	John Bruce, Blackslack.
5.	Coldstone and Migvie.	Daugh.	Samuel Tawse, Ballustraid.
6.	Countess Wells.	Bishop Dams.	Andrew Scorgie, South Lasts.
7.	Crathie.	Newton of Crathie.	Alexander Crichton, Monaltrie.
8.	Dyce.	Guildhall.	James Davidson, Woodland.
9.	Forbes and Fordyce.	Netherton.	Alexander Will, Fingask.
10.	Forgue.	Westerton.	Thomas Gibb, Comisty.
11.	Kennethmont.	Wardhouse.	William Milne, Auchmenzie.
12.	Newhills.	Hope Farm.	John Dawson, Walton.
13.	Old Machar	Mains of Scotstown.	Alexander Kenn, Whitestripes.
14.	Peterculter and Drumoak.	Sunnyside.	William Black, Drum.
15.	Strichen.	Clayfords.	John Forsyth, Meadowhill.
16.	Tough and Lynturk.	Blackpool.	Alexander Murray, Muggarthaugh.

ARGYLLSHIRE.

17.	Islay, Jura, and Colonsay.	Sunaig.	James Morris, Claggan.
18.	Kilfinan.	Auchrossan.	Archibald Gillies, Kildavaig.
19.	Killean and Kilkenzie.	Drum.	James Mitchell, Largiemore.
20.	Kilmartin.	Killinochonoch.	Donald M'Alpine, Ballimore.
21.	Kintyre.	Dalrioch.	Andrew Ronald, jun., Brunerican.
22.	Lorn.	Ferlochan.	Robert Hall, Fasnacloich.

AYRSHIRE.

23.	Ardrossan.	Nethermains.	John Lamont, Bankend.
24.	Ayr.	Knocksoul.	William Brown, Dutch Mills.
25.	Barskimming and Fowler.	Muir.	Hugh Mair, Hillhead.
26.	Carrick.	Knockdon.	William Anderson, Barneil.
27.	Cumnock.	Crosshill.	John Wilson, Tarbeg.
28.	Fenwick.	Glenleith.	James Kerr, Gainhill.
29.	Galston.	Cowgore.	Alexander Ferguson, Sideheads.
30.	Grougar.	Castle Hill.	William Mason, Hemphill.
31.	Kilmarnock.	Grange.	John M'Gregor, Brockley.
32.	Kirkmichael.	Guiltreehill.	Alexander Anderson, Barneil.
33.	Kirkoswald.	Pirleyhill.	Alexander Herron, Park.
34.	Manchline.	Bogwood.	Thomas Wallace, Ballochmyle.
35.	New Cumnock.	Polquheys.	John Young, Lowes.
36.	Sorn and Dalgain.	Hillhead.	John Morrison, Hillhead.
37.	Stair and Coylton.	Gadgirth.	John Auld, Pettock.
38.	Stewarton.	Nether Robertland.	William Templeton, Dunlop House.
39.	Straiton.	Dalmorton.	James M'Kie, Balminnoch.
40.	St Quivox.	Auchincruive.	William Smith, Mossblown.
41.	Tarbolton.	Brownhall.	Alexander Stevenson, Ladyyard.
42.	West Kilbride.	Thirdpart.	James Dinning, Ardneil.

BANFFSHIRE.

43.	Boharm.	Ardoch.	Alexander Leslie, Dinnyhoon.
44.	Keith.	Nethertown.	William Sandison, Auchynannil.
45.	Marnoch.	Mains of Kinnairdy.	John Milne, Headtown of Auchingoil.

BERWICKSHIRE.

46.	Chirnside.	Nether Mains.	Peter Robertson, Edington Mains.
47.	Cockburnspath.	Old Cambus.	John Johnston, Fulfordlees.
48.	Ecclesnewton.	Wormerlaw.	George French, Bartlehill.
49.	Gordon.	Middlethird.	William Middlemiss, Byrewalls.
50.	Lauder.	Thirlestane.	William Simson, Addinstone.
51.	Legerwood.	Boon.	David Thomson, Dods.
52.	Melrose.	Brotherston	Walter Anderson, New Belses.
53.	Westruther.	Westruther Mains.	William Clapperton, Dods.

No.	Name of Society.	Place of Competition.	Silver Medal awarded to.
		BUTE AND ARRAN.	
54.	Arran.	Clauchlands.	Thomas Mair, Clauchan.
55.	Bute.	Auchinterry.	John Barbour, Largavrechtan.
		CAITHNESS-SHIRE.	
56.	Caithness.	Thurso Castle.	Peter M'Donald, Barns of Olrig.
		DUMBARTONSHIRE.	
57.	Kilmarnock and Bowhill.	Gartocham.	William Buchanan, Blairquhomerie.
58.	Kirkintilloch.	Wester Bedcow.	William Hay, Orchardton.
		DUMFRIESSHIRE.	
59.	Kirkconnel.	Eastside.	David Frazer, Tower.
60.	Mouswald.	Drummuir.	James Swan, Pearbanks.
61.	Penpont.	Longmuir.	John M'Call, Stroan.
62.	Upper Annandale.	Wamphraygate.	John Ewart, Cleughbrae.
63.	Wester Kirk.	Craig.	Alexander Murray, Balliehill.
		EDINBURGHSHIRE.	
64.	Borthwick.	Halflakill.	Thomas Shepherd, Halkerston.
65.	Carrington and Whitehill.	Brouchrigg.	William Mitchell, Parduvine.
66.	Cockpen and Newbattle.	Dalhousie.	John Hunter, Wester Cowden.
67.	Currie.	Wester Kinleith.	William Steadman, Wester Kinleith.
68.	Glencorse.	Greenlaw Mains.	Walter Hunter, Marchwell.
69.	Lasswade.	Langhill.	James Dougall, Boghall.
70.	Temple.	Toxside.	John Wilson, Huntliecot.
71.	West Calder.	Westmains.	James Alison, Parkhead.
72.	W. District of Mid-Lothian.	Clifton.	Alexander Meikle, Crofthead.
		ELGINSHIRE.	
73.	Abernethy.	Ballifurth.	Donald M'Intosh, Croftronan.
74.	Kirdells and Knockando.	Tomindougle.	William Younie, Bishopcroft.
75.	Morayshire.	Linkwood.	Charles M'Kerrow, Kirkhill.
76.	Spey, Avon, and Fiddochside.	Ballindalloch.	Lewis Beaton, Lagmore.
77.	Urquhart.	Upper Mefts.	Alexander Finlayson, Mefts.
		FIFESHIRE.	
78.	Auchtermuchty.	Upper Pitlochie.	John Kirk, Wellfield.
79.	Crossgates.	Prathouse.	David Wilkie, Nether Beath.
80.	Dunnikier.	Skeddoway.	Andrew Lumsden, Mutton Hall.
81.	Dysart and Wemyss.	Bowhouse.	David Wright, Strathore.
82.	Largo.	Monturpie.	Henry Dalrymple, Balcormie.
83.	Leslie.	Ingrie.	George Cooper, Balfarg.
84.	Saline.	Sunnybraes.	George Drysdale, Gartknowie.
		FORFARSHIRE.	
85.	Tannadice and Oathlaw.	Newmill.	Francis Stewart, Coul.
		HADDINGTONSHIRE.	
86.	Dunbar, Spott, & Innerwick.	Pathhead.	William Sleigh, Pathhead.
87.	Humbie.	Humbie Mill.	Alexander Richardson, Duncrahill.
88.	Lammermuir.	Bothwell.	William Blakie, Ellenford.
		INVERNESS-SHIRE.	
89.	Glen Urquhart.	Drumnadrochit.	Kenneth M'Kenzie, Corrimony.
90.	Inverness.	Cradlehall.	David Ellison, Cantray.
91.	Strathspey.	Cluny.	Frank Grant, Tombea.
		KINCARDINESHIRE.	
92.	Durris.	Upper Balfour.	David Annand, Standingstones.
93.	Elsick.	East Macduff.	Robert Mutch, Newhall.
94.	Muchalls and Cookney.	Greenheads.	James Kemp, Easter Muchalls.
95.	Netherley.	Upper Craigwells.	James Middleton, Sauchenshaw.
96.	Nigg.	Kirkhill.	John Strachan, Blackhill.
97.	Portlethen.	Cookstone.	William Ross, Greenhowe.
98.	Rickarton, Ury, and Cowie.	Megray.	Paul Cruickshank, Millhill.
99.	Strachan.	Dalbrake.	John Scott, Midtown.
		KINROSS-SHIRE.	
100.	Fossoway and Tulibole.	Wood of Coldrain.	Matthew Fowlis, Threapmuir.

STEWARTRY OF KIRKCUDBRIGHT.

No.	*Name of Society.*	*Place of Competition.*	*Silver Medal awarded to.*
101.	Glenkens.	Newfield.	John Thomson, Troquhain.
102.	New Abbey.	Overton.	James Robison, Carsegowan.
103.	Rerriek.	Fagra.	Edward Kerr, Riddick.

LANARKSHIRE.

104.	Cadder.	Auchinleck.	William Renwick, Gairbred.
105.	Calderwaterhead.	Birniehill.	James Thomson, Greenhill.
106.	Carnwath.	Carnwath Mill.	John Somerville, Millridge.
107.	Crawford and Crawfordjohn.	Crawfordjohn.	James M'Morran, Abington.
108.	Culter.	Culterhaugh.	James Dempster, Easterplace.
109.	Dalserf.	Cauderside.	Alexander Yueal, Broomfield.
110.	East Kilbride.	Brankumhall.	Gavin Lennox, Hills.
111.	Hamilton, Blantyre, &c.	Burnbank & Greenfield.	Arthur Jackson, Barnhill.
112.	Liberton.	Muirhouse.	John Ritchie, Whitecastle.
113.	New Monkland.	Ryding Mains.	John Scott, jun., Whiteside.
114.	Old Monkland.	East Shawhead.	Alexander Steel, Heatheryknowe.
115.	Wiston and Roberton.	Newton.	Robert Ross, Longwell.

LINLITHGOWSHIRE.

116.	Kinneil.	Muirhouse.	William Learmonth, Upper Kinneil.
117.	West Lothian.	Echline.	William Hunter, Threemiletown.
118.	Whitburn.	Burnbrae.	John Cruickshanks, Standhill.

NAIRNSHIRE.

119.	Nairnshire (Farming).	Meikle Urchany.	Kenneth M'Kay, Meikle Geddes.
120.	Nairnshire (Ploughing).	Blackhills.	William Bruce, Brightmony.

PEEBLESSHIRE.

121.	Biggar and Skirling.	South Mains.	William Forrest, West Toftcombs.
122.	Manor.	Hundleshope.	Adam Walker, Haswellsykes.
123.	Peebles.	Ferniehaugh.	David Inglis, Crookstone.
124.	West Linton.	Hyndfordwell.	John Fleming, Ferniehaugh.

PERTHSHIRE.

125.	Alyth and Airlie.	Balmyle.	James Cooke, Braidston.
126.	Ardoch.	Whiteston.	Andrew Sharp, Blueton.
127.	Auchterarder.	Middle Fardon.	David Boswell, East Kirkton.
128.	Blair-Drummond, &c.	Drip Hill.	Walter Hallum, Roseburn Lane.
129.	Callander.	Duilatter.	Archibald M'Laren, Auchenlauch.
130.	Comrie and Up. Strathearn.	Lawers.	George Ferguson, Meggar.
131.	Culross.	East Grange.	John Wardlaw, Balgownie Mains.
132.	Drummond Castle.	Findall.	Thomas Marshall, Templemill.
133.	Dunblane.	Cairnston.	William Mackison, Ballingrew.
134.	Gask.	Clathy Beg.	Daniel Douglas, Clathy.
135.	Glenalmond.	Fendoch.	William Martin, Glenalmond.
136.	Madderty.	Greenhall.	James Hunter, Cowdens.
137.	Methven.	Meckphen.	John Dow, Balgowan.
138.	M. D. of Athole and Tullymet.	Milton of Tullymet.	Donald Shaw, Ballinluig.
139.	Monzievaird and Strowan.	Victoria.	William M'Kenzie, Lochland.
140.	Moulin.	Balledmund.	Alexander Scott, Donavourd.
141.	Port of Monteith.	Blaircessnock.	Daniel M'Kerracher, Collimoon Moss.
142.	Rannoch.	Innerhadden.	Malcolm M'Gregor, Wester Tempar.
143.	Stormont.	Hill of Couttie.	Hugh Paterson, Coupar Grange.
144.	Strathbraan.	Torfuack.	John M'Cowan, Meikle Trochray.
145.	Strathearn.	Bogtonlea.	John Todd, Belhie.
146.	St Martins.	Mavisbank.	John Ower, Boghall.
147.	Weem.	Farleyer.	Colin Menzies, jun., Coshieville.

RENFREWSHIRE.

148.	Cathcart and Eastwood.	Overlee.	James Bradshaw, Shawmoss.
149.	Erskine.	Dargavel.	James Brown, Newton.
150.	Inchinnan.	Linburn.	Walter Blackwood, Bottom.

ROSS-SHIRE.

No.	*Name of Society.*	*Place of Competition.*	*Silver Medal awarded to.*
151.	Caberfeidgh.	Arcan Mains.	George M'Intosh, Tarradale.
152.	Easter Ross.	Meddat.	William Scott, Balnagown.
153.	Wester Ross.	Drummore.	Alexander Macdonald, Coul Mains.

ROXBURGHSHIRE.

154.	Border Union.	Rutherford.	Robert Thomson, Courthill.
155.	Lilliesleaf.	Firth.	Walter Anderson, New Belses.
156.	West Teviotdale.	Spittal.	George Mullins, Lanton Mill.

STIRLINGSHIRE.

157.	Bannockburn and Plean.	Rosehill.	William Weir, Inches.
158.	Craigforth and Touch.	Kingspark.	James Stevenson, Whitehouse.
159.	Eastern Dist. of Stirlingshire.	Carmuirs.	Archibald Ronald, Dorrotor.
160.	Gargunnock.	Beild.	William Forrester, Kepdarroch.
161.	Killearn and Lower District of Strathendrick.	Ballochruin.	William Morrison, Gartness.
162.	Muiravonside.	Craigend.	John Gentleman, Parkhall.

WIGTOWNSHIRE.

163.	Kirkmaiden.	Low Drumore.	John M'Colm, Slockmill.
164.	Machars.	Sorbie.	William Davidson, Barsalloch.
165.	Old Luce.	Garnoch.	Daniel Lavrie, Dunragit.
166.	Penningham, Minnigaff, and Kirkmabreck.	Baltersan.	Andrew M'Adam, Blackpark.
167.	Stoneykirk.	Balgreggan.	John Wilson, Freugh.

STATE OF THE FUNDS

OF

THE HIGHLAND AND AGRICULTURAL SOCIETY,

At 30th NOVEMBER 1868.

I.	Investments on Bonds—				
	Heritable Bonds, ...			£13,279 16	0
	Railway Debentures, ...			7,450 0	0
	Glasgow Water Corporation Debentures, . .			1,000 0	0
				£21,729 16	0
II.	Value of Bank Stocks, at price on 30th November 1868, ...			26,823 12	8
III.	Balance due by Royal Bank—				
	On Deposit Receipt (waiting Investment), ...	£500 0	0		
	On Current Account, . .	767 12	2		
				1,267 12	2
IV.	Ten Shares (£500) of Stock of British Fishery Society, valued at			200 0	0
V.	Property, George IV. Bridge, . . .			3,100 0	0
VI.	Furniture, Pictures, and Books, . . .			1,000 0	0
VII.	Value of Medals on Hand, . . .			8 14	6
VIII.	Sums outstanding in connection with Shows—				
	Glasgow, £5; Aberdeen, £10, . . .			15 0	0
XI.	Arrears of Members' Subscriptions considered Recoverable, ...			84 0	6
				£54,228 15	10

KENNETH MACKENZIE, C.A., *Auditor.*

ABSTRACT of the ACCOUNTS of the HIGHLAND and

CHARGE.

1.	BALANCE due by Royal Bank of Scotland at 30th November 1867,					£3,224	14 1
2.	ARREARS of Annual Subscriptions then due, . .	£180	14	0			
	Whereof due by Life Members since compounded, and thus extinguished, £85, 19s. 6d.; since ordered to be written off as irrecoverable, £54, 16s. 6d., ...	140	16	0			
						39	18 0
3.	MEDALS on hand at 30th November 1867, ...					13	8 0
4.	GLASGOW SHOW, Subscriptions outstanding at do, . . .					450	0 0
5.	INCOME FROM INVESTMENTS—						
	Interest on £13,279, 16s. Heritably Secured, .	£499	6	7			
	,, on £8,400 in Debenture Bonds, .	374	10	6			
	,, on Bank Accounts, . . .	18	13	8			
		£892	10	9			
	Dividends on £12,420, 14s. 1d. of Bank Stock (present value £26,823, 12s, 8d.), £1,214 5 2						
	Dividend on £500 of the Stock of the British Fishery Society, 20 0 0						
		1,234	5	2			
						2,126	15 11
6.	SUBSCRIPTIONS—						
	Annual Subscriptions, ...	£727	15	0			
	Life do.	916	2	6			
						1,643	17 6
7.	SUBSCRIPTIONS to Chemical Department, ...					89	17 6
8.	RECEIPTS at Aberdeen Show, 1868, as per Auditor's States, .					3,230	14 11
						£10,819	5 11

EDINBURGH, *6th January* 1869.

AGRICULTURAL SOCIETY of SCOTLAND, for the Year 1867 68.

DISCHARGE.

1.	ESTABLISHMENT—				
	Salary to Secretary for year to Martinmas 1868,			£700	0 0
	Auditor for year 1867,			30	0 0
	Clerk, 1868, £255; Junior Clerk, £76, 5s.,			331	5 0
	Curator of Machinery, £10; Messenger, £60, 15s.,			70	15 0
				£1,132	0 0
	Feu-Duty, £28; Taxes, £36, 8s.; Water-Duty, £1, 10s.,			65	18 0
	Gas, £6, 13s. 5d.; Coals, £10, 15s.; Fire Premiums, £6, 10s.,			23	18 5
	Repairs and Furnishings, £22, 19s.; Sundries, £20, 3s. 3d.,			43	2 3
				£1,264	18 8
2.	CHEMICAL DEPARTMENT—				
	Salary to Professor, £300; Manures and Allowances to Experimenters, £139, 1s.,			439	1 0
3.	VETERINARY DEPARTMENT—				
	Allowance to Professor of Veterinary Surgery, £26, 5s.; Professor of Cattle Pathology, £100; Medals, £4, 16s.; Advertising, £6, 10s. 2d.,			137	11 2
4.	GRANT TO AGRICULTURAL CHAIR, £75; Prizes to Class, £10; Advertising, £7, 19s. 9d.; Incidental Expenses, £1, 2s.,			94	1 9
5.	PREMIUMS—				
	Glasgow Show, £129, 8s.; Aberdeen Show, £1281, 11s.; District Competitions, £632, 5s.; Ploughing Competitions, £108, 11s.; Reports, £119, 6s.,			2,271	1 0
6.	PRINTING, £60, 11s.; Advertising, £35, 17s. 4d.; Stationery, £33, 10s.; Post and Receipt Stamps, £46, 5s.,			176	3 4
7.	BUSINESS ACCOUNTS—Recovering Arrears of Subscriptions, £9, 16s. 6d.; Law Agent's Charges, £19, 8s. 6d.,			29	5 0
8.	SOCIETY'S TRANSACTIONS—Printing and Circulating,			278	15 0
9.	MISCELLANEOUS—				
	Donation to Croall Fund, £21; Subscription to Meteorological Society, £5; Reporting Meetings, £3, 3s.; Re-striking Medals, &c., £2, 8s. 1d.; and Incidental Outlays, £12, 9s. 8d.,			44	0 9
10.	TRAVELLING EXPENSES—Deputation to London as to Veterinary Charter for Scotland, and Secretary and Clerk attending Meetings in regard to Shows,			66	2 0
11.	EXPENSES of Aberdeen Show, 1868, per Auditor's States,			2,163	3 1
12.	INVESTMENTS—On Heritable Bonds, £2479, 16s.; Deposit Receipt (waiting Investment), £500,			2,979	16 0
				£9,943	18 9
13.	ARREARS FOR GENERAL SHOWS—				
	1. Glasgow Show—Balance due by County of Lanark,	£5 0 0			
	2. Aberdeen Show—Stall Rent,	10 0 0			
		£15 0 0			
14.	BALANCE in Royal Bank at close of the Account,	767 12 2			
15.	MEDALS on hand at do.,	8 14 6			
16.	ARREARS of Subscriptions considered recoverable,	84 0 6			
				875	7 2
				£10,819	5 11

ANTHONY MURRAY, *Chairman of Finance Committee.*
W. S. WALKER, *Director, and Member of Finance Committee.*
KENNETH MACKENZIE, *Auditor.*

ABSTRACT of ACCOUNTS—

CHARGE.

I. Local Subscriptions—			
1. Aberdeenshire—Voluntary Assessment on Proprietors, .		£445	13 9
2. Banffshire do. do. .		121	6 11
3. Kincardineshire do. do. .		161	9 9
4. Forfarshire (Eastern Division) do. do. .		184	16 0
5. Aberdeen—Contribution by Town Council, . . .		75	0 0
6. Local Societies—Contributed by Royal Northern Society, .		100	0 0
7. Do. do. by Spey, Avon, and Fiddoch-side Association, ...		12	12 0
8. Contribution in aid of Premium for Thoroughbred Horse, .		50	0 0
		£1,150	18 5
2. Amount Collected during Show—			
1. Drawn at Gates, ...	£1,428 1 8		
2. Catalogues and Awards, . . .	148 18 8		
		1,577	0 4
3. Rent of Stalls and Shedding, ...		437	1 6
4. Rent of Refreshment Rooms, ...		60	0 0
5. Interest from Royal Bank, ...		5	14 8
		£3,230	14 11
6. Balance, ...		213	19 2
		£3,444	14 1

To the above Balance of	£213 19 2
There must be added the Premiums undrawn at 30th November, amounting to	240 2 0
Making the probable expense to the Society, . . .	£454 1 2

Edinburgh, *6th January* 1869

ABERDEEN SHOW, 1868.

DISCHARGE.

1. Show Yard—Fitting up, £1,441.—Bedding for Stock, £11, 4. 7d.—Town Water Pipes, £2, 12s. 6d.—Miscellaneous Payments, £2, 3s.	£1,467	0	1
2. Police Force,	25	8	0
3. Travelling Expenses of Judges, Secretary, Clerks, &c.,	170	8	3
4. Hotel and other Bills for Judges, Directors, Secretary, &c.,	154	0	10
5. Tickets to President's Banquet for do. do.,	30	19	6
6. Bands in Show Yard and at President's Banquet,	27	0	0
7. Printing Catalogues, Awards, &c.,	141	0	0
8. Advertising,	37	19	5
9. Allowance to Local Secretaries,	21	0	0
10. Extra Clerks,	8	17	0
11. Allowance to Practical Engineer and Travelling Expenses,	24	0	0
12. Trial of Implements, Expense attending,	7	3	6
13. Assistants, Porters, and Attendants,	18	8	3
14. Postage Account,	26	8	4
15. Carriage of Catalogues and Incidental Expenses,	3	9	11
Amount of General Expenses,	£2,163	3	1
16. Premiums drawn at 30th November 1868,	1,281	11	0
	£3,444	14	1

ANTHONY MURRAY, *Chairman of Finance Committee.*
W. S. WALKER, *Director and Member of Finance Committee.*
KENNETH MACKENZIE, *Auditor.*

ABSTRACT OF THE ACCOUNTS

OF THE

ARGYLL NAVAL FUND FOR 1867–68.

CHARGE.			
1. BALANCE in Royal Bank of Scotland at 30th November 1867,	£218	2	4
2. INTEREST on £3000 Heritable Security,	116	17	10
3. INTEREST on £2200 Debenture Bonds,	94	1	10
4. PROGRESSIVE INTEREST on Bank Account,	1	15	4
	£460	17	4

DISCHARGE.			
1. ALLOWANCE to Five Recipients,	£200	0	0
2. BALANCE in Royal Bank at 30th November 1868,	260	17	4
	£460	17	4

EDINBURGH, 6*th January* 1869.

ANTHONY MURRAY, *Chairman of Finance Committee.*
W. S. WALKER, *Director and Member of Finance Committee.*
KENNETH MACKENZIE, C.A., *Auditor.*

APPENDIX (D.)

PREMIUMS

OFFERED BY

THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND,

IN

1869.

CONTENTS.

PAGE

General Notice, ... 5

Constitution and Management, ... 6

Establishment for 1869, ... 7

Council on Education, ... 9

Standing Committees for 1869, ... 10

General Regulations for Competitors, ... 13

CLASS I.—REPORTS.

§ 1. On Subjects connected with the Science and Practice of Agriculture :—

1. Agriculture of East Lothian, ... 14
2. Agriculture of Inverness-shire, ... 14
3. Ancient Farming Customs in Scotland, ... 14
4. Striking the Fiars' Prices in Scotland, ... 14
5. Manures produced by different kinds of Feeding, . . 15
6. Manures made with and without cover, ... 15
7. Autumn Manuring, ... 15
8. Covering Grain Crops, ... 16
9. Improved varieties of Agricultural Plants, ... 16
10. Comparative productiveness of Potatoes, ... 16
11. Comparative productiveness of Turnips, ... 16
12. Cultivation of Cabbage as a Field Crop, ... 16
13. Vegetable productions of India, China, and America, . . 17
14. Best modes of housing fattening Cattle, ... 17
15. Different descriptions of Food for Stock, ... 17
16. Duties of the Veterinary Surgeon in examining Horses, . 18
17. Disinfecting Agents for Stock, ... 18
18. Dipping, Pouring, and Smearing Sheep, ... 18
19. Veterinary Contracts, ... 18
20. Transporting Butcher-meat, ... 19
21. Vessels used for transporting Milk from Country Districts, . 19
22. Rural economy Abroad susceptible of being introduced into Scotland, ... 19

§ 2. Land Improvements :—

1. General improvement of Estates by Proprietors, . . . 19
2. Reclamation of Waste Land by Tillage by Proprietor or Tenant, 19
3. Improvement of Natural Pasture without Tillage, . . 20

§ 4. Agricultural Machinery :—

Invention or improvement of Implements of Husbandry, . 20

§ 4. Woods and Plantations :— PAGE

1. Extensive planting by Proprietors, ... 20
2. General management of Plantations, ... 21
3. Planting on exposed or on barren Tracts, ... 21
4. Value for economical purposes of Corsican Fir, . . . 21
5. Forest Trees of recent introduction, ... 21
6. Home-grown Timber as compared with Foreign, . . . 22
7. Effects of Dry Season of 1868 on Trees and Shrubs, . . 22
8. Seedlings of Conifers, ... 22

CLASS II.—DISTRICT COMPETITIONS.

§ 1. Cattle, ... 23

§ 2. Horses, ... 25

§ 3. Sheep :—

1. Leicester, ... 26
2. Cheviot, ... 27
3. Blackfaced, ... 27
4. Shearing Sheep, ... 28

§ 4. Swine :— 28

CLASS III. DAIRY PRODUCE.

1. Butter, ... 29
2. Cheese, ... 29
3. Medals for Cheese, ... 30

CLASS IV.—CROPS AND CULTURE.

1. Seeds, ... 31
2. Ploughing Competitions, ... 33
3. Reaping Machines, ... 34
4. Medals in Aid of Premiums given by Local Societies, . . 34

CLASS V.—COTTAGES AND GARDENS.

1. Best kept Cottages and Gardens, ... 40
2. Improving existing Cottages, ... 42
3. Building New Cottages, ... 42
4. Accommodation for Farm Servants, ... 42

GENERAL SHOW AT EDINBURGH IN 1869, . . . 43

GENERAL SHOW AT DUMFRIES IN 1870, ... 56

Veterinary Department, ... 59

Agricultural Education, ... 60

Chemical Department, ... 62

Instructions for Selecting Samples for analyses, . . 63

Charges for Analyses, &c., ... 63

GENERAL NOTICE.

The Highland Society was instituted in the year 1784, and established by Royal Charter in 1787. Its operation was at first limited to matters connected with the improvement of the Highlands of Scotland; but the supervision of certain departments, proper to that part of the country, having been subsequently committed to special Boards of Management, several of the earlier objects contemplated by the Society were abandoned, while the progress of agriculture led to the adoption of others of a more general character. The exertions of the Society were thus early extended to the whole of Scotland, and have, for the greater part of a century, been directed to the promotion of the science and practice of agriculture in all its branches.

In accordance with this more enlarged sphere of action, the original title of the Society was altered, under a Royal Charter, in 1834, to The Highland and Agricultural Society of Scotland.

The leading purposes of the Institution are set forth in the following pages, where it will be found that Premiums are awarded for Reports on almost every subject connected with the cultivation of the soil; the rearing and feeding of stock; the management of the dairy; the improvement of agricultural machinery and implements; the growth of timber; the extension of cottage accommodation; the application of chemical science; and the dissemination of veterinary information.

Among the more important measures which have been effected by the Society are—

1. Agricultural Meetings and General Shows of Stock, Implements, &c., held in the principal Towns of Scotland, at which exhibitors from all parts of the United Kingdom are allowed to compete.

2. A system of District Shows instituted for the purposes of improving the breeds of Stock most suitable for different parts of the country, and of aiding and directing the efforts of Local Agricultural Associations.

3. The promotion of Agricultural Education, under powers conferred by a supplementary Royal Charter granted in 1856, and authorising "The Council of the Highland and Agricultural Society on Education" to grant Diplomas to Students of Agriculture (see p. 60.)

4. The advancement of the Veterinary Art, by conferring Diplomas on Students who have passed through a prescribed curriculum, and who are found, by public examination, qualified to practise.

5. The appointment of a Chemist for the purpose of promoting the application of science to agriculture. Investigations on subjects of importance are conducted in the Laboratory, and published in the Transactions. Members can obtain analyses, reports, and advice, on terms below those charged to others (see p. 62.)

6. The periodical publication of the Transactions, which comprehend the proceedings in the Laboratory, reports of experiments, and other communications invited and approved by the Society.

CONSTITUTION AND MANAGEMENT.

The general business of The Highland and Agricultural Society is conducted under the sanction and control of a Royal Charter, which authorises the enactment of Bye-Laws. Business connected with Agricultural Education is conducted under the authority of a Supplementary Royal Charter, also authorising the enactment of Bye-Laws.

The Office-Bearers consist of a President, Four Vice-Presidents, Ten Extraordinary and Thirty Ordinary Directors, a Treasurer, an Honorary and an Acting Secretary, an Auditor, and other Officers. The proceedings of the Directors are reported to General Meetings of the Society, held in January and in June or July. The Council on Education, under the Supplementary Charter, consists of Sixteen Members—Nine nominated by the Charter, and Seven elected by the Society. The Board of Examiners consists of Twelve Members.

Members are elected at the half-yearly General Meetings. The ordinary subscription is L.1, 3s. 6d. annually, which may be redeemed by one payment, varying according to the number of previous annual payments, from L.12, 12s. to L.7, 1s. Tenant-Farmers, Secretaries, and Treasurers of local Agricultural Associations, resident Agricultural Factors, and Proprietors farming the whole of their own lands, whose valuation does not exceed L.500, are admitted on a subscription of 10s. annually, which may be redeemed by one payment, varying according to the number of previous annual payments, from L.5, 5s. to L.3.

Members of the Society receive the Transactions on application, and are entitled to apply for District Premiums—to report Ploughing Matches for the Medal—to attend Shows free of charge, and to exhibit Stock and consult the Chemist at reduced rates.

Orders, payable at the Royal Bank of Scotland, are issued by the Directors, in name of the parties in whose favour Premiums have been awarded.

All communications must be addressed to "Fletcher Norton Menzies, Esq., Secretary of the Highland and Agricultural Society of Scotland, No. 3 George IV. Bridge, Edinburgh."

ESTABLISHMENT FOR 1869.

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MOST NOBLE THE MARQUIS OF TWEEDDALE, K.T.

Vice-Presidents.

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JAMES EWAN NEWTON, Linnbank House.
JOHN WILSON, Professor of Agriculture, University of Edinburgh.
ALEXANDER YOUNG, Keir Mains.

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Sir WILLIAM STIRLING MAXWELL of Keir, Bart., *Honorary Secretary.*
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Rev. JAMES GRANT, D.C.L., D.D., *Chaplain.*
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W. J. MACQUORN RANKINE, LL.D., Professor of Civil Engineering, University of Glasgow, *Consulting Engineer.*
ALEXANDER SLIGHT, *Practical Engineer.*
GOURLAY STEELL, R.S.A., *Animal Portrait Painter.*
WILLIAM WILLIAMS, *Profesor of Veterinary Surgery.*
THOMAS DUNCAN, *Clerk.*
JOHN MACDIARMID, *Junior Clerk.*
WILLIAM BLACKWOOD & SONS, *Publishers.*
NEILL & COMPANY, *Printers.*
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Chairmen of Standing Committees.

1. *Argyll Naval Fund,*	Admiral Sir WM. J. HOPE JOHNSTONE, K.C.B.
2. *Chemistry,*	Professor ANDERSON.
3. *Cottages,*	HARRY MAXWELL INGLIS of Logan Bank.
4. *District Shows,*	A. CAMPBELL SWINTON of Kimmerghame.
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6. *General Shows,*	ALEX. KINLOCH, yr. of Gilmerton.
7. *Hall and Chambers,*	JOHN ORD MACKENZIE of Dolphinton.
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9. *Machinery,*	JOHN GIBSON, Woolmet.
10. *Monthly Meetings,*	Sir THOMAS BUCHAN HEPBURN, Bart.
11. *Premiums for Reports on the Science and Practice of Agriculture*	PATRICK DUDGEON of Cargen.
12. *Premiums for Reports on Woods and Plantations,*	Professor BALFOUR.
13. *Publications,*	ALEXANDER FORBES IRVINE of Drum.
14. *Veterinary Department,*	ANDREW GILLON of Wallhouse.

All communications should be addressed to FLETCHER NORTON MENZIES, Esq., Secretary of the Highland and Agricultural Society of Scotland, No. 3 George IV. Bridge, Edinburgh.

Council on Education.

By a Supplementary Charter under the Great Seal, granted in 1856, the Society is empowered to prescribe a Curriculum for Agricultural Education, and to grant Diplomas (see p. 60.)

Members of Council named by Charter.

The President of the Highland and Agricultural Society—*President.*
The Lord Justice-General—*Vice-President.*

The Lord Advocate.
The Dean of Faculty.
The Professor of Agriculture.
The Professor of Anatomy.
The Professor of Botany.
The Professor of Chemistry.
The Professor of Natural History.

Members of Council named by Society.

Lord Colonsay.
Sir Wm. Gibson-Craig, Bart.
Sir A. C. R. Gibson-Maitland, Bart., M.P.
George Hope, Fenton Barns.
Robert Russell, Pilmuir.
Henry Stephens, Redbrae.
John Wilson, Edington Mains.

Board of Examiners.

Science and Practice of Agriculture—Mechanics and Construction—Professor Wilson; George Hope, Fenton Barns; Robert Russell, Pilmuir; and John Wilson, Edington Mains.
Botany—Professor Balfour.
Chemistry—Professor Anderson.
Natural History—Professor Allman.
Veterinary Surgery—Professor Williams.
Field Engineering and Surveying—Professor Macquorn Rankine and David Stevenson, C.E.
Book-keeping and Accounts—Kenneth Mackenzie, C.A., and Archibald Paterson, Meadowfield.

Hall and Chambers.

No. 3 GEORGE IV. BRIDGE, EDINBURGH.

STANDING COMMITTEES FOR 1869.

1. ARGYLL NAVAL FUND.

Admiral Sir William J. Hope Johnstone, K.C.B., *Convener.*
Vice-Admiral William Ramsay, C.B.
William S. Walker of Bowland.
Graham Binny, W.S., Edinburgh.
Hew Crichton, S.S.C., Edinburgh.

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Professor Allman, Edinburgh.
„ Balfour, Edinburgh.
„ Wilson, Edinburgh.
Henry Stephens, Redbrae, Edinburgh.
Robert Russell, Pilmuir, Leven.
George Harvey, Whittingham Mains, Prestonkirk.
James Melvin, Bonnington, Ratho.
William Goodlet, Bolshan, Arbroath.
Thomas Park, Stoneyhill, Musselburgh.
George Hope, Fenton Barns, Drem.
William Gray, Southfield, Duddingston, Edinburgh.
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Robert Binnie, Seton Mains, Longniddry.

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Archibald Campbell Swinton of Kimmerghame, Dunse.
Thomas Coutts Trotter, Bilston Lodge, Loanhead.

4. DISTRICT SHOWS.

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Robert Pillans Newton of Castlandhill, Kerse, Falkirk.
John Stirling of Kippendavie, Dunblane.
William S. Walker of Bowland.
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Thomas Mylne, Niddrie Mains, Liberton.
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Hew Crichton, S.S.C., Edinburgh.
Thomas Coutts Trotter, Bilston Lodge, Loanhead.
Thomas A. Hog of Newliston, Kirkliston.
Kenneth Mackenzie, C.A., Edinburgh.

6. GENERAL SHOWS.

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Professor Macquorn Rankine, Glasgow.
Professor Wilson, Edinburgh.
John Gibson, Woolmet, Dalkeith.
George Harvey, Whittingham Mains, Prestonkirk.
John Curror, Comiston, Lothian Burn.
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Alexander Young, Keir Mains, Dunblane.
John Dickson, Saughton Mains, Edinburgh.

7. HALL AND CHAMBERS.

John Ord Mackenzie of Dolphinton, *Convener.*
Sir James Gardiner Baird of Saughton Hall, Bart.
Anthony Murray of Dollerie.
William S. Walker of Bowland.
J. G. Heddle of Melsetter.
Graham Binny, W.S., Edinburgh.

8. LAW.

Graham Binny, W.S., Edinburgh, *Convener.*
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9. MACHINERY.

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Henry Stephens, Redbrae, Edinburgh.
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James Wilson, Wester Cowden, Dalkeith.
Thomas Park, Stoneyhill, Musselburgh.
Robert Russell, Pilmuir, Leven.
Thomas Mylne, Niddrie Mains, Liberton.
Alexander Henderson, Longniddry.

10. MONTHLY MEETINGS.

Sir Thomas Buchan Hepburn of Smeaton, Bart., *Convener.*
Graham Binny, W.S., Edinburgh.
William Gray, Southfield, Duddingston, Edinburgh.
Thomas Park, Stoneyhill, Musselburgh.
Henry Stephens, Redbrae Cottage, Edinburgh.
Archibald Campbell Swinton of Kimmerghame, Dunse.

11. PREMIUMS FOR REPORTS ON THE SCIENCE AND PRACTICE OF AGRICULTURE.

Patrick Dudgeon of Cargen, *Convener.*
Professor Anderson, Glasgow.
„ Balfour, Edinburgh.
„ Allman, Edinburgh.
„ Wilson, Edinburgh.
Alexander Forres Irvine of Drum.
Robert Hutchison of Carlowrie, Kirkliston.
John Gibson, Woolmet, Dalkeith.
And all the Directors.

12. PREMIUMS FOR REPORTS ON WOODS AND PLANTATIONS.

Professor Balfour, Edinburgh, *Convener.*
Alexander Forbes Irvine of Drum.
Patrick Dudgeon of Cargen.
Robert Pillans Newton of Castlandhill, Kerse, Falkirk.
Robert Hutchison of Carlowrie, Kirkliston.
Charles Lawson of Borthwick Hall.

13. PUBLICATIONS.

Alexander Forbes Irvine of Drum, *Convener.*
Professor Balfour, Edinburgh.
Henry Stephens, Redbrae, Edinburgh.
Robert Russell, Pilmuir, Leven.
J. G. Heddle of Melsetter.
William S. Walker of Bowland.
Robert Pillans Newton of Castlandhill.

14. VETERINARY DEPARTMENT.

Andrew Gillon of Wallhouse, *Convener.*
Sir Alexander C. R. Gibson Maitland of Barnton, Bart., M.P.
Professor Balfour, Edinburgh.
„ Allman, Edinburgh.
„ Anderson, Glasgow.
Archibald Campbell Swinton of Kimmerghame, Dunse.
William S. Walker of Bowland.
Alexander Kinloch, yr. of Gilmerton.
Henry Stephens, Redbrae, Edinburgh.
John Gibson, Woolmet, Dalkeith.
George Hope, Fenton Barns, Drem.
William Gray, Southfield, Duddingston, Edinburgh.
James Wilson, Wester Cowden, Dalkeith.
Thomas Mylne, Niddrie Mains, Liberton.
Alexander M'Dougal, Granton Mains, Edinburgh.

The President, Vice-Presidents, Treasurer, and Honorary Secretary, are members *ex officio* of all Committees.

PREMIUMS.

GENERAL REGULATIONS FOR COMPETITORS.

All Reports must be legibly written, and on one side of the paper only; they must specify the number and subject of the Premium for which they are in competition; they must bear a distinguishing motto, and be accompanied by a sealed letter similarly marked, containing the name and address of the Reporter; initials must not be used.

No sealed letter, unless belonging to a Report found entitled to one-half of the Premium offered, will be opened without the author's consent.

Reports, for which a Premium, or one-half of it, has been awarded, become the property of the Society, and cannot be published, in whole or in part, nor circulated in any manner, without the consent of the Directors. All other papers will be returned to the authors, if applied for within twelve months.

When a Report is unsatisfactory, the Society is not bound to award the whole or any part of a Premium.

All Reports must be of a practical character, containing the results of the writer's own observation or experiment, and the special conditions attached to each Premium must be strictly fulfilled. General essays, and papers compiled from books, will not be rewarded. Weights and measurements must be indicated by the imperial standards.

The decisions of the Board of Directors are final and conclusive as to all Premiums, whether for Reports or at General or District Shows; and it shall not be competent to raise any question or appeal touching such decisions before any other tribunal.

Reports on subjects not included in the Premium List will be received, and honorary rewards will be given when merited.

CLASS I.

REPORTS.

SECTION 1.—ON SUBJECTS CONNECTED WITH THE SCIENCE AND PRACTICE OF AGRICULTURE.

1. AGRICULTURE OF EAST LOTHIAN.

For an approved Report on the Agriculture of East Lothian—Thirty Sovereigns.

The Report should embrace full details of the different systems of Farm Management observed in the district, and of the progress which Agriculture has made within the last 25 years.

Reports to be lodged by 1st November 1869.

2. AGRICULTURE OF INVERNESS-SHIRE.

For an approved Report on the Agriculture of Inverness-shire —Thirty Sovereigns.

The Report should embrace full details of the different systems of Farm Management observed in the district, and of the progress which Agriculture has made within the last 25 years.

Reports to be lodged by 1st November 1870.

3. ANCIENT FARMING CUSTOMS IN SCOTLAND.

For an approved Report or Historical Account of the Farming Customs and Covenants of Leases formerly in use in the various Districts or Counties of Scotland—Twenty Sovereigns.

The Report must notice the improvements in Husbandry which have resulted from the abandonment of such customs and covenants, and suggest advantages which might accrue to agricultural enterprise generally from a further extension of such policy.

Reports to be lodged by 1st November 1870.

4. STRIKING THE FIARS PRICES IN SCOTLAND.

For an approved Report on the various modes of striking the Fiars Prices throughout the different Counties of Scotland—The Gold Medal or Ten Sovereigns.

The Report must contain suggestions for the most equitable mode of establishing a uniform system.

Reports to be lodged by 1st November 1869.

5. MANURES PRODUCED BY DIFFERENT KINDS OF FEEDING.

For an approved Report of the results of experiments for ascertaining the comparative value of farm-yard Manure, obtained from cattle fed upon different varieties of food, by the application of such manures to farm crops—Twenty Sovereigns.

The Report must state the effects produced on two successive crops by the application of manure obtained from cattle fed on different sorts of food, such as turnips and straw alone; and turnips and straw, with an addition of oil-cake, linseed, bean-meal, grain, or other substances. The animals should be as nearly as possible of the same age, weight, condition, and maturity, and each lot should receive daily the same quantity of litter; and, except as to the difference of food, they must be treated alike.

The preparation of the manure, by fermentation or otherwise, should be in every respect the same; and it is desirable that not less than two several experiments be made with each kind, and that the ground to which it is to be applied be as equal as possible in quality and condition.

Reports to be lodged by 1st May in any year.

6. MANURE MADE WITH AND WITHOUT COVER.

For an approved Report on the comparative value of Manure made in the ordinary manner, and of Manure kept under cover till applied to the Land—Twenty Sovereigns.

The experiment may be conducted either with manure made in the open straw-yard, contrasted with that made in covered hammels or boxes, or with manure made in feeding houses, part of which shall have been placed under cover, and part removed to the open dung-pit, and kept carefully unmixed with any other manure. Preference will be given to experiments embracing both of these modes. The cattle must be fed and littered alike. There must be at least an acre of land experimented on with each sort of manure—the different lots must be manured to the same extent, and be equal in soil, and the crops must be accurately weighed and measured on two separate portions of each lot, not less than 20 poles. The result, as given by two successive crops, to be reported.

Reports to be lodged by 1st May in any year.

7. AUTUMN MANURING.

For an approved Report on the comparative advantages of applying Manure to the stubble in autumn, or in the drills in spring, for turnips, potatoes, or beans—Twenty Sovereigns.

The experiment must extend over two years, and comprise a green crop and a grain crop. It must be conducted on not less than four acres—one half of which shall be dunged in autumn, and the other in spring, with manure made as nearly as possible in the same way, and of equal quantity and quality. The treatment and condition of the land prior to the experiment must be mentioned.

As the object of this premium is to determine the comparative advantages of autumn manuring, there will be no restriction as to labouring the land; but the reporter must state how that was done.

lot during the experiment, which, if possible, should be repeated in duplicate.

Reports to be lodged by 1st May 1870.

8. COVERING GRAIN CROPS.

For an approved Report on the cheapest, speediest, and most convenient mode of covering the grain crops in harvest—The Gold Medal, or Ten Sovereigns.

Reports to be lodged by 1st November 1869.

9. IMPROVED VARIETIES OF AGRICULTURAL PLANTS.

For an approved Report on the means successfully employed for obtaining new and superior varieties, or improved sub-varieties, of any of the cereal grains, grasses, roots, or other agricultural plants—The Gold Medal, or Ten Sovereigns.

It is necessary that the varieties and sub-varieties reported upon shall have been proved capable of reproduction from seed, and also that the relation they bear to others, or well-known sorts, should be stated. The reporter is further requested to mention the effects that he may have observed produced by different soils, manures, &c., on the plants forming the subjects of report, and how far he may have ascertained such effects to be lasting.

Should any improved variety reported upon be the result of direct experiment by cross impregnation, involving expense and long-continued attention, a higher premium will be awarded.

Reports to be lodged by 1st November 1869.

10. COMPARATIVE PRODUCTIVENESS OF POTATOES.

For an approved Report on the comparative productiveness and general qualities for use and keeping of different kinds of Potatoes used in field culture, and as to the best mode of storing the same—The Gold Medal, or Ten Sovereigns.

Reports to be lodged by 1st November 1869.

11. COMPARATIVE PRODUCTIVENESS OF TURNIPS.

For an approved Report on the comparative productiveness and general qualities for use and keeping of the different kinds of Swedish, Yellow, and White Turnips, generally used in field culture—The Gold Medal, or Ten Sovereigns.

Reports to be lodged by 1st May 1870.

12. CULTIVATION OF CABBAGE AS A FIELD CROP.

For an approved Report on the cultivation of the Cabbage as a field crop—The Gold Medal, or Ten Sovereigns.

The experiment must be conducted on not less than one acre, and contrasted with a like extent under turnips in the same field. Both lots must have been under one rotation, and must be prepared and manured in the same manner.

Reports to be lodged by 1st May 1870.

13. VEGETABLE PRODUCTIONS OF INDIA, CHINA, AMERICA, &c.

For an approved Report on the hardy and useful Herbaceous Plants of any country where such climate exists as to induce the belief that the plants may be beneficially introduced into the cultivation of Scotland—The Gold Medal, or Ten Sovereigns.

Attention is particularly directed to the Grains and Grasses of China, Japan, the Islands of the Eastern Archipelago, the Himalaya country, the Falkland and South-Sea Islands, California, and the high north-western districts of America.

Reporters are required to give the generic and specific names of the plants treated of, with the authority for the same—together with the native names, so far as known; and to state the elevation of the locality and nature of the soil in which they are cultivated, or which they naturally inhabit, with their qualities or uses; and it is further requested that the descriptions be accompanied, in so far as possible, with specimens of the plants, and their fruit, seed, or other products.

Reports to be lodged by 1st November in any year.

FEEDING STOCK.

The experiments specified in Nos. 14 and 15 must be conducted over a period of not less than three months. No lot shall consist of fewer than four Cattle or ten Sheep. The animals selected should be of the same age, sex, and breed, and, as nearly as possible, of the same weight, condition, and maturity. The live weight before and after the experiment must be stated, and, if killed, their dead weight and quantity of tallow.

14. BEST MODES OF HOUSING FATTENING CATTLE.

For an approved Report on the comparative advantages of fattening Cattle in stalls, in loose houses or boxes, and in sheds or hammels—Twenty Sovereigns.

The Report must detail the comparative result of actual experiments. The same quantities and kinds of food must be used. Information is required as to the comparative expense of attendance, the cost of erecting the buildings, and any other circumstances deserving of attention. The state of the weather during the experiment, in point of temperature and wetness, must be particularly noted and reported.

Reports to be lodged by 1st May in any year.

15. DIFFERENT DESCRIPTIONS OF FOOD FOR STOCK.

For an approved Report of experiments for ascertaining the actual addition of weight to growing or fattening Stock, by the use of different kinds of food—Twenty Sovereigns.

The attention of the experimenter is directed to turnips, carrots, beet, mangold-wurzel, potatoes, cabbage, as well as to beans, oats, barley, Indian corn, linseed, oil-cake, or rape-cake, and to the effect of warmth and proper ventilation, and the difference between food

cooked and raw. The above roots and other kinds of food are merely suggested; competitors are neither restricted to them, nor obliged to experiment on all of them.

When experiments are made with linseed and cake, attention should be paid to the comparative advantages, economically and otherwise, of the substances in these two states.

Before commencing the comparative experiments, the animals must be fed alike for some time previously.

The progress of different breeds may be compared. This will form an interesting experiment of itself, for reports of which encouragement will be given.

Reports to be lodged by 1st May in any year.

16. EXAMINING HORSES AS TO SOUNDNESS.

For an approved Report on the duties of the Veterinary Surgeon in the Examination of Horses as to Soundness—The Gold Medal, or Ten Sovereigns.

Competition is limited to Members of Veterinary Medical Associations.

Reports to be lodged by 1st November 1869.

17. DISINFECTING AGENTS FOR STOCK.

For an approved Report on disinfecting Agents, especially Sulphurous Acid and Carbolic Acid, for preventing attacks of Cattle Plague and Pleuro-Pneumonia, or in extirpating these diseases when they have appeared—The Gold Medal, or Ten Sovereigns.

Reports to be lodged by 1st November 1869.

18. DIPPING AND SMEARING SHEEP.

For an approved Report on the processes of Dipping, Pouring, and Smearing Sheep, and the materials employed for the purpose—Twenty Sovereigns.

The reporter must discuss the relative advantages of Dipping, Pouring, and Smearing, the use of summer dips, the nature and qualities of the different materials which have been used, and their effect on the wool and on the health of the Sheep. The facts detailed must be derived from the practical experience of the reporter.

Reports to be lodged by 1st November 1869.

19. VETERINARY CONTRACTS.

For an approved Report on the advantages of a system of contract entered into between Stockowners and Veterinary Surgeons—The Medium Gold Medal, or Five Sovereigns.

The Report must state the price, including operations and medicines, at which Horses and Cattle per head, and Sheep per score, can be attended to per annum. The charges which should be considered as extras must also be specified.

Reports to be lodged by 1st November 1869.

20. TRANSPORTING BUTCHER MEAT.

For an approved Report on the improved methods of transporting Butcher Meat for distances that may occupy from 24 to 48 hours, so that it may arrive in the least injured condition—The Medium Gold Medal, or Five Sovereigns.

Reports to be lodged by 1st November 1869.

21. VESSELS USED FOR TRANSPORTING MILK.

For an approved Report on improvements in the Vessels used for transporting Milk from Country Districts to the neighbouring Towns—The Medium Gold Medal, or Five Sovereigns.

Reports to be lodged by 1st November 1869.

22. RURAL ECONOMY ABROAD.

For an approved Report, founded on personal observation, of any useful practice, in rural economy, adopted in other countries, and susceptible of being introduced with advantage into Scotland—The Gold Medal.

The purpose chiefly contemplated by the offer of this premium is to induce travellers to notice and record such particular practices as may seem calculated to benefit Scotland.

Reports to be lodged by 1st November in any year.

SECTION 2.—LAND IMPROVEMENTS.

1. GENERAL IMPROVEMENT OF ESTATES.

To the Proprietor who shall report the most judicious, successful, and extensive improvements—The Gold Medal, or Ten Sovereigns.

The merits of the Report will not be determined so much by the mere extent of the improvements, as by their character and relation to the size of the property. The improvements may comprise reclaiming, draining, enclosing, planting, road-making, building, and all other operations proper to landed estates. The period within which the operations may have been conducted is not limited, except that it must not exceed the term of the reporter's proprietorship.

Reports to be lodged by 1st May in any year.

2. RECLAMATION OF WASTE LAND BY TILLAGE.

1. For an approved Report by a Proprietor or Tenant of having reclaimed within the six preceding years not less than fifty acres of waste land—The Gold Medal, or Ten Sovereigns.

2. For an approved Report by a Tenant of having reclaimed within the four preceding years not less than twenty acres of waste land—The Medium Gold Medal, or Five Sovereigns.

3. For a similar Report by a Tenant of having reclaimed not less than ten acres—The Silver Medal.

The Reports may comprehend such general observations on the improvement of waste lands as the writer's experience may lead him to make, but must refer especially to the lands reclaimed—to the nature of the soil—the previous state and probable value of the subject—the obstacles opposed to its improvement—the details of the various operations—the mode of cultivation adopted—and the produce and value of the crops produced. As the required extent cannot be made up of different patches of land, the improvement must have relation to one subject; it must be of a profitable character, and a rotation of crops must have been concluded before the date of the report. *A detailed statement of the expenditure and return*, and a certified measurement of the ground, are requisite.

Reports to be lodged by 1st May in any year.

3. IMPROVEMENT OF NATURAL PASTURE WITHOUT TILLAGE.

1. For an approved Report of an improvement of the pasturage of not less than thirty acres, by means of top-dressing, draining, or otherwise without tillage, in situations where tillage may be inexpedient—The Gold Medal, or Ten Sovereigns.

2. For an approved Report of a similar improvement of not less than ten acres—The Silver Medal.

Reports must state the particular mode of management adopted, the substances applied, the elevation and nature of the soil, its previous natural products, and the changes produced.

Reports to be lodged by 1st May in any year.

SECTION 3.—AGRICULTURAL MACHINERY.

INVENTION OR IMPROVEMENT OF IMPLEMENTS OF HUSBANDRY.

For approved Reports of such inventions or improvements, by the reporters, of any agricultural implement or machine as shall be deemed by the Society of public utility—Medals, or sums of money not exceeding Fifty Sovereigns.

Reports may be lodged with the Secretary at any time, and should be accompanied by drawings and descriptions of the implement or machine, and, if necessary, by a model.

SECTION 4.—WOODS AND PLANTATIONS.

1. EXTENSIVE PLANTING.

For an approved Report by a Proprietor who shall, within the five preceding years, have planted not less than 150 acres—The Gold Medal.

The whole planting operations that may have been conducted by the reporter within the five years, whether completed or not, must be embraced, and he must state the expense—description of soil—age,

kind, and number of trees planted per acre—mode of planting, draining, and fencing—general state of the plantation—and any other observations of interest

Reports to be lodged by 1st November in any year.

2. GENERAL MANAGEMENT OF PLANTATIONS.

For an approved Report of the management of Plantations from the commencement of the first thinning till the period of yielding full-grown timber—The Gold Medal, or Ten Sovereigns.

The Report must embrace the following points:—The progress of the different sort of trees—the effects of altitude and exposure—the general advantages of shelter—the mode of thinning and pruning adopted—the uses and value of the thinnings—the plan of registry and of valuing, or a specimen of the method in which the forester's book is kept—the valuation at the time of the report—together with such general remarks as may be thought useful.

The Report is not expected to embrace the formation and early management, farther than the description of soil, kinds of plants, whether mixed or in masses, together with a note of the expense from the time of planting to the commencement of the first thinning, in so far as such information is in the possession of the reporter.

Reports to be lodged by 1st November in any year.

3. PLANTING ON EXPOSED OR ON BARREN TRACTS.

For an approved Report on successful planting within the influence of the sea, or on exposed sterile tracts, founded on observation of the habits and appearance of the different sorts of trees considered best suited for such situations—The Gold Medal, or Ten Sovereigns.

The plantations reported on must not be less than ten years old.

Information is particularly desired regarding the species and varieties of trees calculated for growing in situations unfavourable to most of those generally cultivated, as bleak heaths, sandy links, unsheltered maritime situations, and high northern exposures.

The reporter must specify the extent of planting and mode of drainage and fencing—the nature of the soil and subsoil—the elevation and exposure of the locality—its distance from the sea; and, if in his power, he should notice the geological features of the district.

Reports to be lodged by 1st November in any year.

4. CORSICAN FIR.

For an approved Report on the value, for economical purposes, of the Corsican Fir, and on its adaptation to different soils and situations—The Medium Gold Medal, or Five Sovereigns.

The reporter's observations must go beyond the limited knowledge of this tree as hitherto grown in Britain, and must embrace its nature, uses, and adaptations in those countries of which it is a native.

Reports to be lodged by 1st November in any year.

5. FOREST TREES OF RECENT INTRODUCTION.

For an approved Report on the more extended introduction of

hardy, useful, or ornamental trees, which have not hitherto been generally cultivated in Scotland—The Medium Gold Medal, or Five Sovereigns.

The Report should specify as distinctly as possible the kind of trees introduced. The adaptation of the trees for use or ornament, and their comparative progress, should be mentioned. Attention is directed to the introduction of any tree as a nurse in young plantations, which by growing rapidly for several years, and attaining maturity when at the height of 20 or 25 feet, might realise the advantages and avoid the evils of thick planting.

Reports to be lodged by 1st November in any year.

6. HOME-GROWN TIMBER AS COMPARED WITH FOREIGN.

For an approved Report on the comparative advantages, in point of economy as well as durability, of home-grown Timber as compared with foreign, for general out-door estate work—The Medium Gold Medal, or Five Sovereigns.

Reports to be lodged by 1st November 1869.

7. EFFECTS OF DRY SEASON 1868 ON TREES AND SHRUBS.

For an approved Report on the effects of the very dry season of 1868 on Trees and Shrubs in different soils, situations, and elevations—The Medium Gold Medal, or Five Sovereigns.

The object in proposing this subject is to ascertain the various varieties of Coniferæ and Hardwood Trees and Shrubs most capable of withstanding severe drought in different soils and situations in this climate, and the reporter will therefore specify how the different varieties were variously affected, with records of the range of temperature where practicable.

Reports to be lodged by 1st November 1869.

8. SEEDLINGS OF CONIFERS.

For an approved Report on the results obtained by experience of Seedlings of Coniferæ, being the produce of trees grown in Britain, as compared with plants obtained from foreign-ripened seed—The Medium Gold Medal, or Five Sovereigns.

The probable age and appearance of seed-producing Trees in this country must be stated where known. Attention is particularly requested as to seedlings of the Corsican Pine, Larch, and *Abies Douglasii*, and other recently introduced Conifers, after a period of 10, 12, or more years' growth.

Reports to be lodged by 1st November 1870.

CLASS II.

DISTRICT COMPETITIONS.

The Money Premiums awarded at District Competitions will be paid after 1st January next, by precepts issued by the Directors. No payments must, therefore, is made by the Secretary or Treasurer of any local Association.

(Grants in aid of DISTRICT COMPETITIONS *for* 1870 *must be applied for before* 1*st* NOVEMBER *next).*

SECTION 1.—CATTLE.

1. ISLANDS OF SHETLAND,—*Convener*, John Bruce, of Sumburgh ; *Secretary*. George Smith, Lerwick.
2. DISTRICT OF ANNANDALE.—*Convener*, Sir William Jardine of Applegarth, Bart. ; *Secretary*, Charles Stewart, Hillside, Lockerbie.
3. DISTRICT OF FORMARTINE. — *Convener*, Major Ramsay of Barra ; *Secretary*, Alexander Davidson, Mains of Cairnbrogie.
4. COUNTY OF BANFF AND DISTRICT OF TURRIFF.—*Convener*, Alexander Morison of Bognie ; *Secretary*, George Cumming, Banff.
5. COUNTY OF ELGIN.—*Convener*, C. L. Cumming Bruce, of Roseisle ; *Secretary*, William Macdonald, Elgin.
6. COUNTY OF NAIRN.—*Convener*, W. A. Stables, Cawdor Castle ; *Secretary*, John Joss, Budgate, Cawdor.
7. ISLAND OF SKYE.—*Convener*, Alexander K. Mackinnon of Corry ; *Secretary*,
8. COUNTIES OF PERTH, FIFE, KINROSS, AND CLACKMANNAN.—*Convener*, Sir William Stirling Maxwell, of Keir, Bart. ; *Secretary*, Melville Jameson, Perth.
9. COUNTY OF KINCARDINE.—*Convener*, Sir Thomas Gladstone, Bart. ; *Secretary*, Robert Crabb, Auchinblae.
10. STEWARTRY OF KIRKCUDBRIGHT.—*Convener*, W. H. Maxwell of Munches, M.P. ; *Secretary*, James Grieve, Dalbeattie.
11. DISTRICT OF KINTYRE.—*Convener*, John Lorn Stewart of Coll ; *Secretary* Thomas Brown, Campbeltown.
12. COUNTY OF DUMBARTON.—*Convener*, Alexander Smollett of Bonhill ; *Secretary*, John Dewar, Dumbarton.
13. DISTRICT OF NITHSDALE.—*Convener*, John Gilchrist Clark, of Speddoch ; *Secretary*, Dr Russell, Thornhill.

PREMIUMS.

1. Best Bull, of any pure breed, not exceeding eight years old, belonging to a Proprietor, The Silver Medal.

Best Bull, of any pure breed, calved before 1st January 1867, and not exceeding eight years old, . . £7

3. Second best, ... £4
4. Best Bull, of any pure breed, calved after 1st January 1867, ... £6

5. Best two-year-old Heifer (if Highland breed, three years), of any pure breed, ... £5
6. Second best, ... £3

Proprietors farming the whole of their own lands may compete for the Money Premiums.

Note.—The Society's Cattle Premiums are granted to each District for three alternate years, on condition that the District shall, in the two intermediate years, continue the Competitions by offering for the same description of stock a sum not less than one-half of that given by the Society.

At the intermediate Competitions, a Silver Medal will be placed at the disposal of the Committee, to be awarded to the best lot of the class for which the District receives Premiums.

In 1869,

Nos. 1, 2, 3, 4, 5, 6, 7, and 8 are in competition for the last year.
No. 9 for the second year.
No. 10 for the first year.
Nos, 11, 12, and 13 compete for local Premiums.

RULES OF COMPETITION.

1. The Members of the Society connected with the respective Districts are appointed Committees for arranging the Competitions; five members to be a quorum.

2. The Convener of each District shall summon a meeting of Committee for the purpose of determining the time and place of Competition, the nomination of Judges, and other preliminary arrangements. The time and place (which must be within the bounds of the District) shall be publicly intimated by Conveners.

3. The Competitions must take place between the 1st of April and the 20th of October, and are open to all parties within the District, whether members of the local Association or not. The animals exhibited must belong to one of the following pure breeds :—Short-horn, Ayrshire, Polled (Galloway, Angus or Aberdeen), Highland. The Bulls may be of one breed, and the Heifers of another. The Committee shall select the breed, and specify it in the returns.

4. Stock of an inferior description, or which does not fall within the prescribed regulations, shall not be placed for competition. The Premiums shall not be divided. *No Money Premiums shall be adjudged unless there are three lots exhibited, and not more than one-half unless there are six.* A competitor may exhibit two lots in each class. For the Medal, two lots are required.

5. An animal which has gained the Society's first Premium at a previous District or General Show is inadmissible in the same class, except for the Medal; and one which has gained a second Money Premium can only thereafter compete in that class for the first.

6. A Tenant or Factor may compete with Proprietors for the Medal with a Bull which has gained the first Money Premium at a previous Show. When there is any doubt as to whether a competitor should be ranked as a Proprietor or a Tenant, the point is left to the decision of the local Committee.

7. A Bull, the property of two or more tenants, may compete, although the Exhibitors may not be joint-tenants.

8. Stock must be the property of the Exhibitor at the date of entry, *and entry shall be received later than one week previous to the Show.* Entry-money shall not exceed 2½ per cent. on the amount of the Premium to be competed for.

9. Bulls for which the Money Premiums are awarded may be required to serve in the District at least one season ; the rate of service to be fixed by the Committee.

10. Should it be proved to the satisfaction of the Committee that an animal has been entered under a false name, pedigree, or description, for the purpose of misleading the Committee or Judges as to its qualifications or properties, the case shall be reported to the Directors, and submitted by them to the first General Meeting, in order that the Exhibitor shall be disqualified from again competing at the Society's Shows, and his name, if he be a member, struck from the roll.

11. When an animal has previously been disqualified by the decision of any Agricultural Association in Great Britain or Ireland, such disqualification shall attach, if the Exhibitor, being aware of the disqualification, fail to state it, and the grounds thereof, in his entry, to enable the Committee to judge of its validity.

12. Blank reports will be furnished to the Conveners of the different Districts. These must, in all details, be completed and lodged with the Secretary *on or before the 1st of November next*, for the approval of the Directors, against whose decisions there shall be no appeal.

13. A report of the Competition and Premiums awarded at the *intermediate* local Shows, in the several Districts, signed by a Member of the Society, must be transmitted to the Secretary *on or before the 1st November in each year*, otherwise the Society's grants shall terminate.

14. It is to be distinctly understood that in no instance does any claim lie against the Society for expenses attending a show of stock beyond the amount of the Premiums offered.

Section 2.—HORSES

FOR AGRICULTURAL PURPOSES.

Note.—The Society's Stallion Premiums are granted to each district for two years, and are followed by Premiums for other two years for Brood Mares, and again for a similar period by Premiums for Entire Colts and Fillies.

1. Stallions.

1. County of Ayr.—*Convener*, James Baird of Cambusdoon; *Secretaries*, J. and J. M'Murtrie, Ayr.
2. County of Inverness.—*Convener*, Henry W. White of Monar ; *Secretary*, Hugh Fraser, Balloch of Culloden.

Best Stallion, not under three years and nine months, and not above twelve years old, ... £25

In 1869,
No. 1 is in competition for the last year.
No. 2 for the first year.

2. Mares,

Best Brood Mare, ... £10

In 1869
No competition.

3. Entire Colts and Fillies.

1. District of Wester Ross.—*Convener*, K. W. Stewart Mackenzie of Seaforth ; *Secretary*, David Ross, Dingwall.
2. Counties of Perth, Fife, Kinross, and Clackmannan.—*Convener*, Sir G. Graham Montgomery, Bart., MP, ; *Secretary*, Melville Jameson, Perth.

1. Best Entire Colt, foaled after 1st January 1867,	£6
2. Best Entire Colt, foaled after 1st January 1868,	£4
3. Best Filly, foaled after 1st January 1867,	£5
4. Best Filly, foaled after 1st January 1868,	£3

In 1869,

Nos. 1 and 2 are in competition for the Colt Premiums for the last year.

rules of competition.

1. The Members of the Society in the several Districts are appointed Committees of Superintendence. They shall be convened in the manner and for the purposes prescribed by Nos. 1 and 2 of the Regulations for Cattle Competitions.

2. The Competitions must take place within the districts named, unless, in reference to Stallions, special permission has been obtained to the contrary.

3. Four lots in each Class will warrant the award of full, and two lots of half, premiums.

4. Evidence must be produced that the Prize Stallions have had produce.

5. Mares must have foals at their feet, or be entered as being in foal ; in the latter case, payment of the Premiums will be deferred till certificate of birth.

6. The Regulations for Cattle Shows, regarding intimation—entry of stock —its exclusion, if of inferior quality—false entries—extra expenses—and the manner in which the Reports are to be certified and transmitted to the Society, are severally applicable to the Premiums for Horses.

Section 3.—SHEEP.

The Premiums for Sheep are granted for three alternate years, under the same conditions as those for Cattle. See Note, p. 24.

A Silver Medal, as in the case of Cattle, is allowed for the intermediate years, to be awarded to the best lot for which the District receives Premiums.

1. leicester breed.

1. County of Forfar.—*Convener*, Sir John Ogilvy, of Inverquharity, Bart., M.P. ; *Secretary*, J. L. Gordon, Brechin.
2. District of the Border Union Society.—*Convener*, Sir George W. Scott Douglas, of Springwood Park, Bart. ; *Secretary*, William Jerdan, Kelso.
3. County of Edinburgh.—*Convener*, Sir James Gardiner Baird, of Saughton Hall, Bart. ; *Secretary*, James Wilson, Wester Cowden.

1. Best Tup, belonging to a Proprietor,	The Silver Medal.
2. Best Tup of any age,	£5
3. Best Shearling Tup,	£5
4. Best 5 Ewes, not above four Shear,	£5
5. Best 5 Gimmers or Shearling Ewes,	£4

Proprietors farming the whole of their own lands may compete for the Money Premiums.

In 1869,

Nos. 1 and 2 are in competition for the last year.
No. 3 is in abeyance, on account of the Edinburgh Show.

2. CHEVIOT BREED.

1. PASTORAL DISTRICT OF ROSS-SHIRE.—*Convener*, Sir Kenneth S. Mackenzie of Gairloch, Bart. ; *Secretary*, William Moffat, Dingwall.
2. COUNTY OF SUTHERLAND.—*Convener*, The Duke of Sutherland, or in his absence, George Loch ; *Secretaries*, R. B. Sangster, Golspie, and William Mitchell, Ribigill.
3. DISTRICTS OF ESKDALE AND LIDDESDALE.—*Convener*, William E. Malcolm of Burnfoot ; *Secretary*, Alexander Stevenson, Langholm.
4. DISTRICTS OF MULL, COLL, AND TYREE.—*Convener*, Farquhar Campbell of Aros ; *Secretary*, David Thorburn, Tobermory.

1. Best Tup belonging to a Proprietor,	The Silver Medal.
2. Best Tup of any age,	£5
3. Best Shearling Tup,	£5
4. Best 5 Ewes, not above four Shear,	£5
5. Best 5 Gimmers or Shearling Ewes,	£4

Proprietors farming the whole of their own lands may compete for the Money Premiums.

In 1869,

Nos. 1 and 2 are in competition for the last year.
Nos. 3 and 4 compete for local Premiums.

3. BLACKFACED BREED.

1. DISTRICT OF ATHOLE AND WEEM.—*Convener*, Sir Robert Menzies of Menzies, Bart. ; *Secretary*, James Mitchell, Pitlochrie.
2. DISTRICT OF BADENOCH.—*Convener*, Cluny Macpherson ; *Secretary*, Donald Stewart, Biallid.
3. DISTRICT OF LORN.—*Convener*, T. W. Murray Allan of Glenfeochan ; *Secretary*, Duncan Clerk, Oban.

1. Best Tup belonging to a Proprietor,	The Silver Medal.
2. Best Tup of any age,	£5
3. Best Shearling Tup,	£5
4. Best 5 Ewes, not above four Shear,	£5
5. Best 5 Gimmers or Shearling Ewes,	£4

Proprietors farming the whole of their own lands may compete for the Money Premiums.

In 1869,

Nos. 1 and 2 are in competition for the second year.
No. 3 competes for local Premiums.

RULES OF COMPETITION.

1. The Members of the Society in the several Districts are appointed Committees as under Nos. 1 and 2 of the Regulations for Cattle Competitions, and they shall be convened in the manner and for the purposes specified in these regulations.

2. The Competition is open to all within the district; it shall take place between the 1st of April and the 20th of October, and the time and place must be publicly intimated by each Convener within his district.

3. Aged Tups shall have served the usual number of Ewes for at least three weeks during the previous season. All prize Tups must serve within the district. Ewes and Gimmers must be taken from the Exhibitor's stock bred in the district; and Ewes must have reared Lambs during the season.

4. The Premiums shall not be divided. *No Money Premiums shall be adjudged unless there are three lots exhibited, and only one half if there are not six lots.* Each competitor may show two lots. For the Medal two lots are required.

5. The other regulations for Cattle Competitions,—in regard to the date of entry—the amount of entry-money—the placing of stock—the exclusion of animals which have gained premiums at previous Shows—the right of a tenant or factor, under certain circumstances, to compete for the medal—reporting false enteries—the regulation as to expenses—the manner in which the reports must be certified and transmitted—and the incompetency of appeal against decisions by the Directors,—are applicable to the Premiums for Sheep.

6. Blank reports will be furnished to the Conveners of districts. These must be accurately filled up in all details, signed by the Conveners, and transmitted to the Secretary *by the 1st of November.* Reports of intermediate competitions must be lodged at the same time.

4. SHEARING SHEEP.

The Silver Medal will be given to the best Sheep-shearer in each of the districts in which the premiums for Sheep are in operation.

CONDITIONS.

1. Money Premiums must be awarded by the district at each competition to the amount of not less than L.2.

2. The district Convener will fix the time and place of competition, and make all necessary arrangements.

3. The medal shall not be awarded unless there are three competitors, and it shall always accompany the highest money premium. If two or more lots appear to be equally well executed, preference should be given to that executed within the shortest time.

4. The Conveners shall report the particulars of the competition and the award of the Judges to the Society, along with the report of the sheep premiums in the district.

Section 4.—SWINE.

DISTRICTS.

The County of Orkney.

Convener of Committee.—J. G. Heddle of Melsetter; *Secretary,*

1. Best Boar belonging to a Proprietor, . The Silver Medal.
2. Best Boar, ... £4
3. Second best, ... £2
4. Best Brood Sow, ... £3
5. Second best, ... £1

Proprietors farming the whole of their own lands may compete for the Money Premiums.

The above Premiums are given for three consecutive years.

In 1869,

Orkney is in competition for the first year.

RULES OF COMPETITION.

1. The Regulations for Cattle Competitions are generally to be held as applicable to the Premiums for Swine; and the Conveners and Committees of the Society's members in the districts are accordingly referred to them.
2. Four lots in each Class will warrant the award of full, and two lots of half, Premiums. There must be at least two Competitors for the Medal.
3. Blank reports will be furnished to the Conveners of districts. These must be accurately filled up in all details, signed by the Conveners, and transmitted to the Secretary *by the first of November next.*

CLASS III.

DAIRY PRODUCE.

DISTRICTS.

1. Lower Ward of Renfrewshire.—*Convener,* Sir Michael R. Shaw Stewart, of Ardgowan, Bart. *Secretary,* M. J. Martin, Greenock.
2. District of Lorn.—*Convener,* T. W. Murray Allan of Glenfeochan; *Secretary,* Duncan Clerk, Oban.

1. BUTTER.

1. Best sample of Cured Butter (not less than 14 lbs.) belonging to a Proprietor, . . The Silver Medal.
2. Best sample of Cured Butter (not less than 14 lbs.) . £3
3. Second best, ... £2

2. CHEESE.

4. Best couple of Sweet Milk Cheeses belonging to a Proprietor, ... The Silver Medal.
5. Best couple of Sweet Milk Cheeses, . . . £3
6. Second best, ... £2

Proprietors farming the whole of their own lands may compete for the Money Premiums.

The above Premiums are given for three consecutive years.

In 1869,

No. 1 is in competition for the last year.
No. 2 for the second year.

RULES OF COMPETITION.

1. The Members of the Society resident within the districts are appointed Committees of Superintendence, for the purposes expressed in the regulations for Cattle Competitions. Each Committtee shall fix such general regulations as they may consider proper, and, in particular, the time and place of Competition.

2. Eight Exhibitors in any one Class will warrant an award of full, and four of half, Premiums. There must be at least two Competitors for the Medal.

3. Competitors must certify that the Butter and Cheese exhibited by them are average specimens of the produce of their Dairies in 1869 ; and that the quantity produced during the season has not been less than 1 cwt. of Butter, or 2 cwt. of Cheese.

4. In the event of two or more competing lots being deemed equal in quality, the Premium shall be awarded to the Competitor who has made the larger quantity.

5. The successful Competitors, before receiving the Premiums, are required to transmit to the Secretary a detailed report of the whole process followed by them in the manufacture of their Butter or Cheese.

6. Reports of the award of the Premiums to be lodged with the Secretary *on or before the* 1st *November next.*

3. MEDALS FOR CHEESE AND BUTTER.

Four Medium Gold and Four Medium Silver Medals for Cheese, and Two Silver and Two Medium Silver Medals for Butter, will be placed at the disposal of the Ayrshire Association, to be competed for at Kilmarnock as follows:—

1. Best Cheddar Cheese, . .	Medium Gold Medal.
Second best, . . .	Medium Silver Medal.
2. Best of any other Imitation English Cheese,	Medium Gold Medal.
Second best, . . .	Medium Silver Medal.
3. Best Dunlop Cheese, . .	Medium Gold Medal.
Second best, . . .	Medium Silver Medal.
4. Best Sweet Milk Cheese, made according to any other method, . .	Medium Gold Medal.
Second best, . . .	Medium Silver Medal.
5. Best sample of Cured Butter, .	The Silver Medal.
Second best, . . .	Medium Silver Medal.
6. Best sample of Powdered Butter, .	The Silver Medal.
Second best, . . .	Medium Silver Medal.

Convener, Colonel Ferrier Hamilton of Cairnhill ;
Secretaries, J. & J. M'Murtrie, Ayr.

CLASS IV.

CROPS AND CULTURE.

1. SEEDS.

The Society, with a view of aiding Local Associations, gives the Medium Silver Medal in the following Districts, for Seeds:—

1. County of CAITHNESS.—*Convener*, Alexander Henderson of Stemster; *Joint Secretaries*, James Brims, Writer, Thurso; and James Purves, Lochend, Dunnet.

    1. Any variety of Barley.
    2. Any variety of Oats.

2. Islands of SHETLAND.—*Convener*, John Bruce of Sumburgh; *Secretary*, George Smith, Lerwick.

    1. Any variety of Bere.
    2. Any variety of Oats.
    3. Perennial Ryegrass.

3. District of SPEY, AVON, and FIDDOCHSIDE.—*Convener*, Sir George Macpherson Grant, Bart; *Secretary*, James Stuart, Aldich.

    1. Any variety of Barley.
    2. Any variety of Oats.

4. District of STRATHEARN.—*Convener*, Viscount Strathallan; *Secretary*, H. M. Borthwick, Forteviot.

    1. Any variety of Oats.

5. District of STRATHSPEY.—*Convener*, The Earl of Seafield *Secretary*, Francis Macbean, Grantown.

    1. Any variety of Barley.
    2. Any variety of Oats.
    3. Perennial Ryegrass.

6. County of ELGIN.—*Convener*, C. L. Cumming Bruce of Roseisle; *Secretary*, William Macdonald, Elgin.

    1. Any variety of Wheat.
    2. Any variety of Barley.
    3. Any variety of Oats.
    4. Any variety of Turnips.
    5. Any variety of Potatoes.
    6. Perennial Ryegrass.

7. County of Stirling.—*Convener*, John Stirling of Kippendavie; *Secretary*, John M. Cunningham, Stirling.

1. Any variety of Wheat.
2. Any variety of Barley.
3. Any variety of Oats.
4. Any variety of Beans.
5. Tares.

8. District of Dalkeith.—*Convener*, Robert Scott Moncrieff of Fossoway; *Secretary*, James Wilson, Wester Cowden.

1. Any variety of Wheat.
2. Any variety of Barley.
3. Any variety of Oats.
4. Any variety of Beans.

9. District of Glen Urquhart.—*Convener*, The Earl of Seafield; *Secretary*, W. J. Fraser, Shewglie.

1. Any variety of Oats.
2. Any variety of Barley.
3. Any variety of Potatoes.

10. County of Banff and District of Turriff.—*Convener*, Alexander Morison of Bognie; *Secretary*, George Cumming, Banff.

1. Any variety of Barley.
2. Any variety of Oats.

11. Wester Ross.—*Convener*, K. W. Stewart Mackenzie of Seaforth; *Secretary*, David Ross, Dingwall.

1. Any variety of Wheat.
2. Any variety of Barley.
3. Any variety of Oats.
4. Tares.

12. Easter Ross.—*Convener*, Kenneth Murray of Geanies; *Secretary*, Duncan Cameron, Tain.

1. Any variety of Wheat.
2. Any variety of Barley.
3. Any variety of Oats.
4. Perennial Rye Grass.

The Medals are given for five consecutive years.

In 1869,

Nos. 1, 2, 3 and 4 are in competition for the last year.
Nos. 5 and 6 for the third year.
Nos. 7, 8, 9, and 10 for the second year.
Nos. 11 and 12 for the first year.

RULES OF COMPETITION.

1. In each district the Convener shall fix the time and place of Competition, appoint the Judges, and make all other necessary arrangements, in concurrence with the other Members of the Society, and the local Association of the District. Conveners will be furnished with blank Schedules for reporting the awards.

2. The quantity shown in Competition by each Grower must not be less than three quarters of each variety of Grain, or two quarters of Beans or Grass Seeds. There must at least be two Competitors. The first Premium awarded by the district shall not be less than L.1 for each kind of Grain for which a Medal is claimed.

3. The Judges shall be guided in their awards—1*st*, By the purity of the Seed; 2*d*, By its freeness from extraneous Seeds; and, 3*d*, Where there is an equality in these respects, by the Weight.

4. Successful Competitors must transmit, free of expense, two imperial quarts of each kind of Seed, addressed to the Secretary, at the Society's Hall, 3 George IV. Bridge, Edinburgh.

5. The Returns must show, as accurately as possible, the produce per imperial acre, also the altitude, exposure, and nature of the soil on which the crops were raised, together with the dates of sowing and reaping, and the weight per bushel. The varieties for which premiums have been given must be named. Reports of the several competitions must be lodged *by the* 1*st of November*.

6. The Medals will be continued in each district for five consecutive years. Applications from other Districts must be lodged with the Secretary of the Society *by* 1*st November next*.

2. PLOUGHING COMPETITIONS.

The Silver Medal will be given to the winner of the first or highest Premium at Ploughing Competitions, provided a Report in the following terms is made to the Secretary, within one month of the Competition, by a Member of the Society:—

FORM OF REPORT.

I, of Member of the Highland and Agricultural Society, hereby certify that I attended the Ploughing Match of the Association at in the county of on the when ploughs competed; of land was assigned to each, and hours were allowed for the execution of the work. The sum of L. was awarded in the following proportions, viz.:—

[Here enumerate the names and designations of successful Competitors.]

RULES OF COMPETITION.

1. All Matches must be at the instance of a Local Society or Ploughing Association, and no Match at the instance of an individual, or confined to the tenants on one estate, will be recognised.

2. The title of such Society or Association, together with the name and address of the Secretary, must be registered with the Secretary of the Highland and Agricultural Society, 3 George IV. Bridge, Edinburgh.

3. Not more than one Match in the same season can take place within the bounds of the same Society or Association.

4. All Reports must be lodged within one month of the date of the Match, and certified by a Member of the Society who was present at it.

5. A Member can only report one Match, and a Ploughman can only carry one Medal in the same season.

6. To warrant the Medal there must have been fifteen ploughs in Competition, and Three Pounds awarded in Premiums.

7. Ploughmen shall not be allowed any assistance, and their work must not be set up nor touched by others; on land of average tenacity the ploughing should be at the rate of an imperial acre in ten hours, and attention should be given to the firmness and sufficiency of the work below, more than to its neatness above the surface.

3. REAPING MACHINES.

The Medium Silver Medal will be given to the servant found most expert at a trial of Reaping Machines, when not fewer than four were in operation, and Premiums to the amount of Two Sovereigns were awarded. Reports must be lodged with the Secretary *not later than the 1st of November*, by a Member who has inspected the work.

4. MEDALS IN AID OF PREMIUMS GIVEN BY LOCAL SOCIETIES.

The Society being anxious to co-operate with local Associations, will give a limited number of Medium Silver Medals annually, in addition to the Money Premiums awarded in the district, for—

1. STOCK.—To Local Societies not on the list of District Competitions, awarding Premiums for Stock to the amount of L.10—Two Medium Silver Medals for the best Male and for the best Female Animals of any Pure Breed.
2. FAT STOCK.—To Local Clubs not on the list of District Competitions, awarding Premiums for Fat Stock to the amount of L.20—Four Medium Silver Medals for best Ox—Best Cow or Heifer—Best pen of Sheep—Best Pig.
3. WOOL.—Best sample of any variety of Wool—Medium Silver Medal for each variety.
4. Best managed Farm.
5. Best managed Green Crop.
6. Best managed Hay Crop.
7. Best managed Dairy.
8. Best Sweet Milk Cheese.
9. Best Cured Butter.
10. Best Collection of Seeds.
11. Best Collection of Roots.
12. Best kept Fences.
13. Best kept Amateur's Garden.
14. Best kept Cottage and Garden under L.15 of rent.
15. Most expert Hedge Cutter.
16. Most expert Labourer at Draining.

Aberdeenshire.

1. VALE OF ALFORD ASSOCIATION—*Convener*, Robert O. Farquharson of Haughton; *Secretary*, Hugh M'Connack, Crobhlar.

    1. Best Male and best Female Animals.

2. BUCHAN SOCIETY—*Convener*, George Baird of Strichen; *Secretary*, John Ferguson, Brae of Coynach.

    1. Best Male and best Female Animals.

3. Cluny Association—*Convener*, John Gordon of Cluny; *Secretary*, William Downie, Mains of Linton.
   1. Best Male and best Female Animals.
   2. Best managed Farm.
   3. Best managed Green Crop.

4. Deeside District—*Convener*, Major Innes of Learney; *Secretary*,
   1. Best Male and best Female Animals.

5. Donside Club—*Convener*, George Milne of Kinaldie; *Secretary*, William Wishart, Cairntradlyn.
   1. Best managed Green Crop.

6. Garioch Society—*Convener*, James Gordon of Manar; *Secretary*, John Annand, Inverurie.
   1. Best managed Green Crop (2 Medals).

7. Kennethmont Society—*Convener*, Col. Leith Hay of Rannes, C.B.; *Secretary*, A. Henderson, V.S., Seggieden.
   1. Best Male and best Female Animals.

8. Leochel-Cushnie Society—*Convener*, Arthur Forbes Gordon of Rayne; *Secretary*, Hary Shaw, Bogfern.
   1. Best Male and best Female Animals.
   2. Best managed Green Crop.

9. Lonmay and Crimond—*Convener*, Sir Alexander Bannerman of Crimonmogate, Bart.; *Secretary*, Dr Bruce, Cortes.
   1. Best kept Cottage and Garden.

10. Turriff Association—*Convener*, Alexander Stuart of Laithers *Secretary*, William Ingram, Turriff.
   1. Best Male and best Female Animals.
   2. Best Collection of Seeds.
   3. Best Collection of Roots.
   4. Best Sweet Milk Cheese.
   5. Best Cured Butter.

Argyllshire.

11. Argyle District—*Convener*, W. A. Campbell of Ormsary; *Secretary*, W. J. B. Martin, Killinochonoch.
   1. Best Male and best Female Animals.

12. Inverary Society—*Convener* and *Secretary*, John MacArthur, Inveraray.
   1. Best Male and best Female Animals.

13. Islay, Jura, and Colonsay Society—*Convener*, R. D. Campbell of Jura; *Secretary*, Robert Ballingal, Eallabus, Islay.
   1. Best Male and best Female Animals.

14. Kilfinan Society—*Convener*, Campbell Macpherson Campbell of Ballimore; *Secretary*, W. Anderson, Ballimore.
   1. Best Male and best Female Animals.

15. Strontian Society—*Convener*, Sir Thomas Miles Riddell, Bart.; *Secretary*, Alexander Kinnear, Strontian, Fort-William.

1. Best Male and best Female Animals.

Ayrshire.

16. Ardrossan Society—*Convener*, David Cunningham, Chapelton; *Secretary*, J. Campbell, Saltcoats.

1. Best Sweet Milk Cheese.
2. Best Cured Butter.

17. Carrick Society—*Convener*, James Baird of Cambusdoon; *Secretary*, David Brown, Maybole.

1. Best managed Green Crop.

18. Cumnock Society—*Convener*, C. V. H. Campbell of Nether Place; *Secretary*, James Murray, Old Cumnock.

1. Best Male and best Female Animals.
2. Best Sweet Milk Cheese.
3. Best Cured Butter.
4. Best Collection of Seeds.
5. Best Collection of Roots.

19. Galston Society—*Convener*, Alexander D. Tait of Milrig; *Secretary*, James Hendrie, Galston.

1. Best Male and best Female Animals.

20. Kilmarnock Club—*Convener*, Frederick J. Turner, The Dean; *Secretary*, James Wilson, Kilmarnock.

1. Best managed Farm.
2. Best managed Green Crop.
3. Best managed Dairy.

21. Mauchline Society—*Convener*, C. V. Hamilton Campbell of Nether Place; *Secretary*, H. W. Kilgour, Mauchline.

1. Best Male and best Female Animals.
2. Best managed Farm.
3. Best managed Dairy.
4. Best Cured Butter.

22 Sorn Society—*Convener*, Graham Somervell of Sorn; *Secretary*, John Stevenson, Hillhead.

1. Best Male and best Female Animals.
2. Best kept Fences.
3. Best Sweet Milk Cheese.
4. Best Cured Butter.

23. Stewarton Society—*Convener*, John Lindsay, Thornhill.

1. Best Male and best Female Animals.
2. Best Sweet Milk Cheese.

24. Tarbolton Society—*Convener*, John Bell of Enterkine; *Secretary*, Andrew Morgan, Tarbolton.

1. Best Sweet Milk Cheese.

25. West Kilbride Society—*Convener*, John Crawford, Millstonford.

1. Best Male and best Female Animals.

2. Best Sweet Milk Cheese.
3. Best managed Green Crop.

Bute and Arran.

26. Bute Society—*Convener*, Henry Stuart, Rothesay.

1. Best Male and best Female Animals.
2. Best managed Green Crop.

27. Arran—*Convener*, James Paterson, Lamlash.

1. Best Male and best Female Animals.

Caithness.

28. Caithness Society—*Convener*, Alexander Henderson of Stemster; *Joint-Secretaries*—James Brims, Writer, Thurso; and James Purves, Lochend, Dunnet.

1. Best Male and best Female Animals.

Clackmannan.

29. Clackmannanshire Society—*Convener*, James Johnstone of Alva; *Secretary*, John Bleloch, Hazleyshaw.

1. Best managed Green Crop.
2. Best managed Hay Crop.

Dumfriesshire.

30. Nithsdale Society—*Convener* and *Secretary*, Dr Russell, Thornhill.

1. Best Sweet Milk Cheese.
2. Best Cured Butter.

31. Sanquhar Society—*Convener*, James Veitch, of Elliock; *Secretary*, W. O. Macqueen, Sanquhar.

1. Best Male and best Female Animals.
2. Best Sweet Milk Cheese.
3. Best Cured Butter.
4. Best Collection of Seeds.
5. Best Collection of Roots.

Edinburghshire.

32. Penicuik Society—*Convener*, Charles Cowan of Logan House; *Secretary*, James Alexander, Penicuik.

1. Best Male and best Female Animals (in abeyance in 1869.)

33. Western District of Mid-Lothian Association—*Convener*, Peter M'Lagan of Pumpherston, M.P.; *Secretary*, James Hislop, Mid-Calder.

1. Best Male and best Female Animals (in abeyance in 1869.)

Elginshire.

34. Forres and Northern Club—*Convener*, Robert Grant of Kincorth; *Secretary*, R. H. Harris, Earnhill.

1. Best Ox.
2. Best Cow or Heifer.
3. Best Pen of Sheep.
4. Best Pig.
5. Best Collection of Seeds.
6. Best Collection of Roots.

35. Spey, Avon, and Fiddochside Society—*Convener*, Sir George Macpherson Grant, Bart.; *Secretary*, James Stuart, Aldich.
    1. Best Male and best Female Animals.
    2. Best managed Farm.
    3. Best managed Green Crop.

Inverness-shire.

36. Inverness Society—*Conveners*, Arthur Forbes of Culloden and Henry W. White of Monar; *Secretary*, Hugh Fraser, Balloch of Culloden.
    1. Best samples of any variety of Wool (five varieties).
    2. Best managed Farm.
    3. Best managed Green Crop.

37. Northern Counties Fat Show Club—*Convener*, The Hon. The Master of Lovat; *Secretary*, Hugh Rose, Inverness.
    1. Best Ox.
    2. Best Cow or Heifer.
    3. Best Pen of Sheep.
    4. Best Pig.

Kincardineshire.

38. Kincardineshire Club—*Convener*, Sir Thomas Gladstone, Bart.; *Secretary*, Robert Crabb, Auchinblae.
    1. Best managed Green Crop.

39. Fettercairn Club—*Convener*, Lieut.-Col. M'Inroy of The Burn; *Secretary*, C. Durie, Daladies.
    1. Best Male and best Female Animals.
    2. Best managed Green Crop.

Lanarkshire.

40. Avondale Society—*Convener*, John Stewart, Burnside; *Secretary*, Thomas Tennant, Strathaven.
    1. Best Male and best Female Animals.

41. Cadder Society—*Convener*, Alexander Campbell, Crosshill; *Secretary*, John Marshall, jun., 168 St Vincent Street, Glasgow.
    1. Best Male and best Female Animals.

42. Hutchesontown Gardens, Glasgow—*Secretary*, George Coghill, Glasgow.
    1. Best kept Amateur's Garden.

43. Victoria Gardens, Govanhill, Glasgow—*Secretary*, Sam. Hillhouse, Glasgow.
    1. Best kept Amateur's Garden.

Linlithgowshire.

44. Whitburn Society—*Convener*, Robert Gardner, Whitburn.
    1. Best Male and Female Animals (in abeyance in 1869).

Nairnshire.

45. Nairnshire Society—*Convener*, W. A. Stables, Cawdor Castle; *Secretary*, John Joss, Budgate.
    1. Best managed Farm.

Orkney and Shetland.

46. Shetland Society—*Convener*, John Bruce of Sumburgh; *Secretary*, George Smith, Lerwick.
    1. Best Sweet Milk Cheese.
    2. Best Cured Butter.

Peeblesshire.

47. Broughton Society—*Convener*, James Tweedie of Quarter; *Secretary*, Archibald Henderson, Broughton.

1. Best Cured Butter.

48. West Linton Society—*Convener*, W. A. Woddrop of Dalmarnock; *Secretary*, James Thomson, Holmes.

1. Best Sweet Milk Cheese.
2. Best Cured Butter.

Perthshire.

49. Culross Society—*Convener*, Laurence Dalgleish, West Grange; *Secretary*, Peter Kilpatrick, Balgownie Mains.

1. Best managed Farm.

50. Dunblane Club—*Convener*, John Stirling of Kippendavie.

1. Best managed Green Crop.

51. Middle District of Athole and Tullymet—*Convener*, William Dick of Tullymet; *Secretary*, Duncan Macdonald, Ballinluig.

1. Best managed Green Crop.

52. Weem and Breadalbane—*Convener*, E. O. Douglas of Killiechassie; *Secretary*, Rev. John M'Lean, Pitilie.

1. Best kept Amateur's Garden.

Renfrewshire.

53. County of Renfrew—*Convener*, Sir Michael R. Shaw Stewart of Ardgowan, Bart.; *Secretary*, R. L. Henderson, Paisley.

1. Best Male and best Female Animals.

Ross-shire.

54. Black Isle Society—*Convener*, James Fletcher of Rosehaugh; *Secretary*, George Gillanders, Fortrose.

1. Best Male and best Female Animals.

55. Wester Ross Club—*Convener*, K. W. Stewart Mackenzie of Seaforth; *Secretary*, David Ross, Dingwall.

1. Best Male and best Female Animals.

Wigtownshire.

56. Kirkmaiden Society—*Convener*, Gilbert R. Murray, Chapelrossan.

1. Best Male and best Female Animals.

REGULATIONS.

1. The Money Premiums given in the District must be L.2 in each case, except in No. 1, where it must be L.10, and No. 2, L.20.
2. In No. 14 the annual value of the Cottage with Garden and ground must not exceed L.15.
3. A Competitor can only carry one Medal in the same year with the same animal, or green crop, &c.
4. Reports on the several Competitions, and applications for Medals in 1870, must be lodged *by 1st November next.*

CLASS V.

COTTAGES AND GARDENS.

The following Premiums are offered for Competition in the Parishes after-mentioned. The Medals and one-half of the Premiums are given by the Society, and the other half is contributed by the respective Parishes.

COTTAGES.

1. Best kept Cottage in each Parish—One Pound Five Shillings; and where there are four Competitors—The Silver Medal.
2. Second best—One Pound.
3. Third best—Fifteen Shillings.

GARDENS.

1. Best kept Cottage Garden in each Parish—One Pound Five Shillings; and where there are four Competitors—The Silver Medal.
2. Second best—One Pound.
3. Third best—Fifteen Shillings.

Aberdeenshire.

Leochel-Cushnie—*Convener*, Arthur Forbes Gordon of Rayne.
Strichen—*Convener*, George Baird of Strichen; *Secretary*, John Sleigh, Strichen.
Birse—*Convener*, James Dyce Nicol of Ballogie, M.P.; *Secretary*, Alexander Milne, Ballogie.
Tarland-Cromar—*Convener*, Dr Robertson, Indego.

Edinburghshire.

Balerno and Currie—*Convener*, A. J. Russell, W.S., Edinburgh.

Lanarkshire.

Lesmahagow—*Convener*, W .E. Hope Vere of Blackwood; *Secretary*, George Scott, Lesmahagow.
Douglas—*Convener*, Andrew Smith, Castle Mains, Douglas.
Bothwell (Addie's Square Flower Show), *Convener*, Robert Addie of Viewpark; *Secretary*, Rev. John Pagan, Bothwell.

Peebleshire.

Broughton—*Convener*, James Tweedie of Quarter; *Secretary*, Archibald Henderson, Broughton.

Perthshire.

Forgandenny—*Convener*, Robert Lyal, Farmhall.
Abernethy—*Convener*, John Bosomworth, Abernethy.
Gask—*Convener*, Colonel Macdonald Macdonald of St Martins.
Dunning—*Convener*, James Morison, Rossie.

Wigtownshire.

KIRKCOLM—*Convener*, David Guthrie, Stranraer.
LESWALT—*Convener*, Sir Andrew Agnew of Lochnaw, Bart.
STONEYKIRK—*Convener*, David Frederick, Dumbreddon.

RULES OF COMPETITION.

1. Competitions may take place in the different parishes for Cottages and Gardens, or for either separately.

2. The occupiers of Gentlemen's Lodges and Gardener's Houses, as well as Gentlemen's Servants occupying Cottages in the Policies, or on land in the natural possession of their masters, are excluded. The inspection must be completed by the 1st of October. In making the inspection, the Conveners may take the assistance of any competent judges.

3. The annual value of each cottage, with the ground occupied in the parish by a Competitor, shall not exceed L.5 sterling. A person who has gained the highest premium cannot compete again, but will be entitled to a Medal if certified by the Committee to be equal in merit to the first on the list of Competitors.

4. If the Cottage is occupied by the proprietor, the roof must be in good repair; if the roof is of thatch, it must be in good repair, though in the occupation of a tenant. The interior and external conveniences must be clean and orderly—the windows must be free of broken glass, clean, and affording the means of ventilation. Dunghills, and all other nuisances, must be removed from the front and gables. In awarding the Cottage Premiums, preference will be given to Competitors who, in addition to the above requisites, have displayed the greatest taste in ornamenting the exterior of their houses, and the ground in front and at the gables.

5. In estimating the claims for the Garden Premiums, the judges should have in view:—The sufficiency and neatness of the fences and walks; the cleanness of the ground; the quality and choice of the crops; and the general productiveness of the garden.

6. Reports, stating the number of Competitors, the names of successful parties, and the nature of the exertions which have been made by them, must by transmitted by the Conveners to the Secretary *on or before the 1st November next.*

Parishes desirous of these Premiums must lodge applications with the Secretary *on or before the 1st November next.*

MEDALS FOR COTTAGES OR GARDENS.

The Society will issue annually twelve Medals to local Associations or individuals, who at their own expense establish Premiums for Cottages or Gardens.

The Medals will be issued upon a Report by a Member of the Society in the terms required by the preceding conditions, describing the merits of the Cottages or Gardens. The Reports to be lodged with the Secretary *on or before the 15th October* 1869.

Applied for by

The Mauchline Horticultural Society.—*Convener*, C. V. Hamilton Campbell of Nether Place; *Secretary*—H. W. Kilgour, Mauchline.

Sir George Macpherson Grant, Bart.

Breadalbane and Weem Horticultural Society—*Convener*, E. O. Douglas of Killiechassie; *Secretary*, Rev. John M'Lean, Pitilie.

West Linton Horticultural Society—*Convener*, W. Allen Woddrop of Dalmarnock; *Secretary*, James Thomson, Holmes.

Culross Horticultural Society—*Secretary*, Peter Kilpatrick, Balgownie Mains.

Cumbrae Horticultural Society—*Secretary*, David Harley.

Logiealmond and Glenalmond Horticultural Society—*Secretary*, A. Macdonald.

IMPROVING EXISTING COTTAGES.

To the Proprietor in Scotland who shall report the Improvement of the greatest number of Cottages in the years 1866, 1867, and 1868—The Gold Medal.

BUILDING NEW COTTAGES.

To the Proprietor in Scotland who shall report the Erection of the greatest number of approved Cottages during the years 1865, 1866, 1867, and 1868—The Gold Medal.

RULES OF COMPETITION.

1. Claims for the above Premiums must be lodged with the Secretary on or before the 1st of October next, to allow an inspection to be made of the different Cottages. The inspection will be conducted by a Committee of the Society's Members, and Reports must be transmitted to the Secretary *on or before the 1st November.*

2. The annual value of the Cottage or Cottages separately, with the garden ground, must not exceed L.5.

3. In estimating the claims of the Competitors, the following points will be kept in view:—The external appearance of the Cottages; their internal accommodation; the arrangements of the out-houses; the means of drainage and ventilation; and the expense of the building or of the alteration, compared with its durability and accommodation. When the Cottages of one Competitor are superior in style and comfort to those of another, though not so numerous, the Inspectors will give them the preference, provided they amount at least to three, and have been erected at a moderate expense.

4. Parties competing will forward to the Society Plans, Specifications, and Estimates, of which, and of all information sent therewith, copies may be taken for publication, if the Society shall see fit, and the originals returned to the parties within six months, if desired.

ACCOMMODATION FOR FARM SERVANTS.

To the Proprietor in Scotland who shall have erected on his estate the most approved Farm-buildings in reference to the proper accommodation of Farm-servants—The Gold Medal.

Reports, Plans, and Specifications to be lodged *by the 1st November* 1869.

GENERAL SHOW OF STOCK AND IMPLEMENTS

AT

EDINBURGH,

ON 28TH, 29TH, AND 30TH JULY 1869.

President of the Society.

MOST NOBLE THE MARQUIS OF TWEEDDALE, K.T.

Convener of the Local Committee.

ROBERT DUNDAS OF ARNISTON,
Convener of the County of Edinburgh.

The District connected with the Show comprises the Counties of EDINBURGH, HADDINGTON, and LINLITHGOW.

GENERAL ARRANGEMENTS.

STOCK.

To be entered with the Secretary on or before Wednesday, 16th June. Received in the Yard on Monday and Tuesday, 26th and 27th July, and till 8 A.M. on Wednesday, 28th July. Judged at 9 A.M. on Wednesday. Exhibited Wednesday, Thursday, and Friday, 28th, 29th, and 30th July.

IMPLEMENTS.

To be entered with the Secretary on or before Wednesday, 16th June. Received in the Yard on Tuesday, 20th, and till the evening of Tuesday, 27th July. Exhibited Wednesday, Thursday, and Friday, 28th, 29th, and 30th July.

TERMINATION OF SHOW.

Friday, 30th July, at 5 P.M. Stock and Implements may remain in the Yard till Saturday afternoon.

The Competition is open to Exhibitors from all parts of the United Kingdom.

Members of the Society are admitted to the Show-Yard at half-price during the judging of the Stock. At other periods they have free access.

New Members may be proposed for election at the General Meeting in June.

PREMIUMS.

The Medium Gold Medal will be given to any animal which, having gained the Society's highest Premium at Inverness 1865, *Glasgow* 1867, *or Aberdeen* 1868, *in the Classes of Aged Bulls—Cows—Stallions—or Mares, is disqualified from again competing.* See General Conditions, No. 14.

CLASS I.—CATTLE.

Section	SHORT-HORN.	
1.	Best Bull calved before 1st Jan. 1867,	Twenty Sovereigns
	Second best,	Ten Sovereigns
	Third best,	Medium Silver Medal
	Breeder of best Bull,	The Silver Medal
2.	Best Bull calved after 1st Jan. 1867,	Twenty Sovereigns
	Second best,	Ten Sovereigns
	Third best,	Medium Silver Medal
3.	Best Bull calved after 1st Jan. 1868,	Ten Sovereigns
	Second best,	Five Sovereigns
	Third best,	Medium Silver Medal
4.	Best Cow of any age,	Fifteen Sovereigns
	Second best,	Eight Sovereigns
	Third best,	Medium Silver Medal
5.	Best Heifer calved after 1st Jan. 1867,	Ten Sovereigns
	Second best,	Five Sovereigns
	Third best,	Medium Silver Medal
6.	Best Heifer calved after 1st Jan. 1868,	Eight Sovereigns
	Second best,	Four Sovereigns
	Third best,	Medium Silver Medal

POLLED ANGUS OR ABERDEEN.

7.	Best Bull calved before 1st Jan. 1867,	Twenty Sovereigns
	Second best,	Ten Sovereigns
	Third best,	Medium Silver Medal
	Breeder of best Bull,	The Silver Medal
8.	Best Bull calved after 1st Jan. 1867,	Twenty Sovereigns
	Second best,	Ten Sovereigns
	Third best,	Medium Silver Medal
9.	Best Bull calved after 1st Jan. 1868,	Ten Sovereigns
	Second best,	Five Sovereigns
	Third best,	Medium Silver Medal
10.	Best Cow of any age,	Fifteen Sovereigns
	Second best,	Eight Sovereigns
	Third best,	Medium Silver Medal
11.	Best Heifer calved after 1st Jan. 1867,	Ten Sovereigns
	Second best,	Five Sovereigns
	Third best,	Medium Silver Medal
12.	Best Heifer calved after 1st Jan. 1868,	Eight Sovereigns
	Second best,	Four Sovereigns
	Third best,	Medium Silver Medal

SECTION

GALLOWAY.

13. Best Bull calved before 1st Jan. 1867, . Twenty Sovereigns
Second best, ... Ten Sovereigns
Third best, ... Medium Silver Medal
Breeder of best Bull, . . . The Silver Medal
14. Best Bull calved after 1st Jan. 1867, . Twenty Sovereigns
Second best, ... Ten Sovereigns
Third best, ... Medium Silver Medal
15. Best Bull calved after 1st Jan. 1868, . Ten Sovereigns
Second best, ... Five Sovereigns
Third best, ... Medium Silver Medal
16. Best Cow of any age, . . . Fifteen Sovereigns
Second best, ... Eight Sovereigns
Third best, ... Medium Silver Medal
17. Best Heifer calved after 1st Jan. 1867, Ten Sovereigns
Second best, ... Five Sovereigns
Third best, ... Medium Silver Medal
18. Best Heifer calved after 1st Jan. 1868, Eight Sovereigns
Second best, ... Four Sovereigns
Third best, ... Medium Silver Medal

AYRSHIRE.

19. Best Bull calved before 1st Jan. 1867, . Twenty Sovereigns
Second best, ... Ten Sovereigns
Third best, ... Medium Silver Medal
Breeder of best Bull, . . . The Silver Medal
20. Best Bull calved after 1st Jan. 1867, . Twenty Sovereigns
Second best, ... Ten Sovereigns
Third best, ... Medium Silver Medal
21. Best Cow, in Milk, of any age, . . Fifteen Sovereigns
Second best, ... Eight Sovereigns
Third best, ... Medium Silver Medal
22. Best Cow, in Calf, of any age, . . Fifteen Sovereigns
Second best, ... Eight Sovereigns
Third best, ... Medium Silver Medal
23. Best Heifer calved after 1st Jan. 1867, Ten Sovereigns
Second best, ... Five Sovereigns
Third best, ... Medium Silver Medal
24. Best Heifer calved after 1st Jan. 1868, Eight Sovereigns
Second best, ... Four Sovereigns
Third best, ... Medium Silver Medal

HIGHLAND.

25. Best Bull calved before 1st Jan. 1866, . Twenty Sovereigns
Second best, ... Ten Sovereigns
Third best, ... Medium Silver Medal
Breeder of best Bull, . . . The Silver Medal
26. Best Bull calved after 1st Jan. 1866, . Twenty Sovereigns
Second best, ... Ten Sovereigns
Third best, ... Medium Silver Medal

Section		
27.	Best Bull calved after 1st Jan. 1867,	Ten Sovereigns
	Second best,	Five Sovereigns
	Third best,	Medium Silver Medal
28.	Best Cow of any age,	Fifteen Sovereigns
	Second best,	Eight Sovereigns
	Third best,	Medium Silver Medal
29.	Best Heifer calved after 1st Jan. 1866,	Ten Sovereigns
	Second best,	Five Sovereigns
	Third best,	Medium Silver Medal
30.	Best Heifer calved after 1st Jan. 1867,	Eight Sovereigns
	Second best,	Four Sovereigns
	Third best,	Medium Silver Medal

FAT STOCK.

31.	Best Polled Ox calved after 1st Jan. 1866,	Medium Gold Medal
	Second best,	The Silver Medal
	Third best,	Medium Silver Medal
32.	Best Polled Ox calved after 1st Jan. 1867,	Medium Gold Medal
	Second best,	The Silver Medal
	Third best,	Medium Silver Medal
33.	Best Highland Ox calved after 1st Jan. 1865,	Medium Gold Medal
	Second best,	The Silver Medal
	Third best,	Medium Silver Medal
34.	Best Ditto, calved after 1st Jan. 1866,	Medium Gold Medal
	Second best,	The Silver Medal
	Third best,	Medium Silver Medal
35.	Best Ox, of any Pure or Cross Breed calved after 1st Jan, 1866,	Medium Gold Medal
	Second best,	The Silver Medal
	Third best,	Medium Silver Medal
36.	Best Ditto, calved after 1st Jan. 1867,	Medium Gold Medal
	Second best,	The Silver Medal
	Third best,	Medium Silver Medal
37.	Best Cross Heifer calved after 1st Jan. 1866,	Medium Gold Medal
	Second best,	The Silver Medal
	Third best,	Medium Silver Medal
38.	Best Ditto, calved after 1st Jan. 1867,	Medium Gold Medal
	Second best,	The Silver Medal
	Third best,	Medium Silver Medal

CLASS II.—HORSES

Section FOR AGRICULTURAL PURPOSES.

1.	Best Stallion foaled before 1st Jan. 1866,	Thirty Sovereigns
	Second best,	Fifteen Sovereigns
	Third best,	Medium Silver Medal
	Breeder of best Stallion,	The Silver Medal

SECTION

2. Best Entire Colt foaled after 1st Jan. 1866, Twenty Sovereigns
   Second best, ... Ten Sovereigns
   Third best, ... Medium Silver Medal
3. Best Entire Colt foaled after 1st Jan. 1867, Fifteen Sovereign
   Second best, ... Eight Sovereigns
   Third best, ... Medium Silver Medal
4. Best Entire Colt foaled after 1st Jan. 1868, Ten Sovereigns
   Second best, ... Five Sovereigns
   Third best, ... Medium Silver Medal
5. Best Mare (with Foal at foot) foaled before 1st Jan. 1866, . . . Twenty Sovereigns
   Second best, ... Ten Sovereigns
   Third best, ... Medium Silver Medal
6. Best Mare (in Foal) foaled before 1st Jan. 1866, ... Fifteen Sovereigns
   Second best, ... Eight Sovereigns
   Third best, ... Medium Silver Medal
7. Best Filly foaled after 1st Jan. 1866, Ten Sovereigns
   Second best, ... Five Sovereigns
   Third best, ... Medium Silver Medal
8. Best Filly foaled after 1st Jan. 1867, . Eight Sovereigns
   Second best, ... Four Sovereigns
   Third best, ... Medium Silver Medal
9. Best Filly foaled after 1st Jan. 1868, . Six Sovereigns
   Second best, ... Three Sovereigns
   Third best, ... Medium Silver Medal

EXTRA HORSES.

10. Best Mare or Gelding, foaled before 1st January 1865, suitable for Field, . Twenty Sovereigns
    Second best, ... Ten Sovereigns
    Third best, ... Medium Silver Medal
11. Best Mare or Gelding, foaled between 1st January 1865 and 1st January 1866, suitable for Field, . . . Fifteen Sovereigns
    Second best, ... Eight Sovereigns
    Third best, ... Medium Silver Medal
12. Best Mare or Gelding, foaled between 1st January 1866 and 1st January 1867, suitable for Field, . . . Ten Sovereigns
    Second best, ... Five Sovereigns
    Third best, ... Medium Silver Medal
13. Best Mare or Gelding, foaled before 1st Jan. 1865, suitable for Carriage, . Twenty Sovereigns
    Second best, ... Ten Sovereigns
    Third best, ... Medium Silver Medal
14. Best Draught Mare or Gelding in harness, Medium Gold Medal
    Second best, . . . The Silver Medal
    Third best, ... Medium Silver Medal

SECTION PONIES.

15. Best Mare or Gelding, between 12 and 14 hands high, ... Medium Gold Medal
Second best, ... The Silver Medal
Third best, ... Medium Silver Medal
16. Best Mare or Gelding, under 12 hands high, Medium Gold Medal
Second best, ... The Silver Medal
Third best, ... Medium Silver Medal

CLASS III.—SHEEP.

SECTION LEICESTER.

1. Best Tup not above four shear, . . Ten Sovereigns
Second best, ... Five Sovereigns
Third best, ... Medium Silver Medal
2. Best Dinmont or Shearling Tup, . Ten Sovereigns
Second best, ... Five Sovereigns
Third best, ... Medium Silver Medal
3. Best 5 Ewes not above four shear, . Eight Sovereigns
Second best, ... Four Sovereigns
Third best, ... Medium Silver Medal
4. Best 5 Shearling Ewes or Gimmers, . Eight Sovereigns
Second best, ... Four Sovereigns
Third best, ... Medium Silver Medal

BORDER LEICESTER.

5. Best Tup not above four shear, . . Ten Sovereigns
Second best, ... Five Sovereigns
Third best, ... Medium Silver Medal
6. Best Dinmont or Shearling Tup, . Ten Sovereigns
Second best, ... Five Sovereigns
Third best, ... Medium Silver Medal
7. Best 5 Ewes not above four shear, . Eight Sovereigns
Second best, ... Four Sovereigns
Third best, ... Medium Silver Medal
8. Best 5 Shearling Ewes or Gimmers, . Eight Sovereigns
Second best, ... Four Sovereigns
Third best, ... Medium Silver Medal

CHEVIOT.

9. Best Tup not above four shear, . . Ten Sovereigns
Second best, ... Five Sovereigns
Third best, ... Medium Silver Medal
10. Best Dinmont or Shearling Tup, . Ten Sovereigns
Second best, ... Five Sovereigns
Third best, ... Medium Silver Medal
11. Best 5 Ewes not above four shear, . Eight Sovereigns
Second best, ... Four Sovereigns
Third best, ... Medium Silver Medal
Best Pen of Lambs shown with Ewes . The Silver Medal
12. Best 5 Shearling Ewes or Gimmers, . Eight Sovereigns
Second best, ... Four Sovereigns
Third best, ... Medium Silver Medal

SECTION

BLACKFACED.

13. Best Tup not above four shear, . . Ten Sovereigns
Second best, ... Five Sovereigns
Third best, ... Medium Silver Medal
14. Best Dinmont or Shearling Tup, . Ten Sovereigns
Second best, ... Five Sovereigns
Third best, ... Medium Silver Medal
15. Best 5 Ewes not above four shear, . Eight Sovereigns
Second best, ... Four Sovereigns
Third best, ... Medium Silver Medal
Best Pen of Lambs shown with Ewes, . The Silver Medal
16. Best 5 Shearling Ewes or Gimmers, . Eight Sovereigns
Second best, ... Four Sovereigns
Third best, ... Medium Silver Medal

SOUTHDOWN AND OTHER SHORT-WOOLLED.

17. Best Tup not above four shear, . . Ten Sovereigns
Second best, ... Five Sovereigns
Third best, ... Medium Silver Medal
18. Best Dinmont or Shearling Tup, . Ten Sovereigns
Second best, ... Five Sovereigns
Third best, ... Medium Silver Medal
19. Best 5 Ewes not above four shear, . Eight Sovereigns
Second best, ... Four Sovereigns
Third best, ... Medium Silver Medal
20. Best 5 Shearling Ewes or Gimmers, . Eight Sovereigns
Second best, . . . Four Sovereigns
Third best, ... Medium Silver Medal

LONG-WOOLLED OTHER THAN LEICESTER.

21. Best Tup, not above four shear, . Ten Sovereigns
Second best, ... Five Sovereigns
Third best, ... Medium Silver Medal
22. Best 5 Ewes not above four shear, or Gimmers, ... Eight Sovereigns
Second best, ... Four Sovereigns
Third best, ... Medium Silver Medal

CLASS IV.—SWINE.

SECTION

1. Best Boar, large breed, . . . Eight Sovereigns
Second best, ... Four Sovereigns
Third best, ... Medium Silver Medal
2. Best Boar, small breed, . . . Eight Sovereigns
Second best, ... Four Sovereigns
Third best, ... Medium Silver Medal
3. Best Sow, large breed, . . . Six Sovereigns
Second best, ... Three Sovereigns
Third best, ... Medium Silver Medal

Section		
4.	Best Sow, small breed,	Six Sovereigns
	Second best,	Three Sovereigns
	Third best,	Medium Silver Medal
5.	Best Pen of 3 Pigs, not above 8 months old, large breed,	Four Sovereigns
	Second best,	Two Sovereigns
	Third best,	Medium Silver Medal
6.	Best Pen of 3 Pigs, not above 8 months old, small breed,	Four Sovereigns
	Second best,	Two Sovereigns
	Third best,	Medium Silver Medal

EXTRA STOCK.

Animals not included in the Sections for Competition may be exhibited as Extra Stock, and will receive Honorary Premiums when specially commended.

CLASS V.—POULTRY.

The Medium Silver Medal and the Bronze Medal will be given as First and Second Premiums in all the Sections of Poultry.

Dorking—*Silver Grey.*

Section	Section
1. Cock and 2 Hens.	2. Cockerel and 2 Pullets.

Dorking—*Coloured.*

3. Cock and 2 Hens.	4. Cockerel and 2 Pullets.

Dorking—*White.*

5. Cock and 2 Hens.	6. Cockerel and 2 Pullets.

Cochin-China—*Coloured.*

7. Cock and 2 Hens.	8. Cockerel and 2 Pullets.

Cochin-China—*White.*

9. Cock and 2 Hens.	10. Cockerel and 2 Pullets.

Bramahpootra—*Pencilled.*

11. Cock and 2 Hens.	12. Cockerel and 2 Pullets.

Bramahpootra—*Light.*

13. Cock and 2 Hens.	14. Cockerel and 2 Pullets.

Malay.

15. Cock and 2 Hens.	16. Cockerel and 2 Pullets.

Spanish.

17. Cock and 2 Hens.	18. Cockerel and 2 Pullets.

Scotch Grey.

19. Cock and 2 Hens.	20. Cockerel and 2 Pullets.

Hamburg—*Golden Pencilled.*

21. Cock and 2 Hens.	22. Cockerel and 2 Pullets.

Hamburg—*Silver Pencilled.*

23. Cock and 2 Hens.	24. Cockerel and 2 Pullets.

HAMBURG—*Golden Spangled.*

SECTION	SECTION
25. Cock and 2 Hens.	26. Cockerel and 2 Pullets.

HAMBURG—*Silver Spangled.*

27. Cock and 2 Hens.	28. Cockerel and 2 Pullets.

POLISH—*White Crested Black.*

29. Cock and 2 Hens.	30. Cockerel and 2 Pullets.

POLISH—*Golden Spangled.*

31. Cock and 2 Hens.	32. Cockerel and 2 Pullets.

POLISH—*Silver Spangled.*

33. Cock and 2 Hens.	34. Cockerel and 2 Pullets.

GAME—*Black or Brown Reds.*

35. Cock and 2 Hens.	36. Cockerel and 2 Pullets.

GAME—*Duckwings.*

37. Cock and 2 Hens.	38. Cockerel and 2 Pullets.

GAME—*Any other Variety.*

39. Cock and 2 Hens.	40. Cockerel and 2 Pullets.

BANTAMS—*Game.*

41. Cock and 2 Hens.	42. Cockerel and 2 Pullets.

BANTAMS—*Gold-laced Sebright.*

43. Cock and 2 Hens.	44. Cockerel and 2 Pullets.

BANTAMS—*Silver-laced Sebright.*

45. Cock and 2 Hens.	46. Cockerel and 2 Pullets.

BANTAMS—*Any other Variety.*

47. Cock and 2 Hens.	48. Cockerel and 2 Pullets.

ANY OTHER DISTINCT BREED OF POULTRY.

49. Cock and 2 Hens.	50. Cockerel and 2 Pullets.

CAPONS—*of any Breed.*

51. 3 Capons.

DUCKS—*White Aylesbury.*

52. Drake and 2 Ducks.	53. Drake and 2 Ducklings.

DUCKS—*Rouen.*

54. Drake and 2 Ducks.	55. Drake and 2 Ducklings.

DUCKS—*Any other Distinct Breed.*

56. Drake and 2 Ducks.	57. Drake and 2 Ducklings.

TURKEYS—*Black Norfolk.*

58. Cock and 2 Hens.	59. Cock and 2 Hens (Poults).

TURKEYS—*Any other Breed.*

60. Cock and 2 Hens.	61. Cock and 2 Hens (Poults).

GEESE—*Grey Toulouse.*

62. Gander and 2 Geese.	63. Gander and 2 Goslings.

GEESE—*Embden.*

64. Gander and 2 Geese.	65. Gander and 2 Goslings.

CLASS VI.—IMPLEMENTS.

Premiums for Implements and Machinery have been withdrawn, and trials, during the currency of a Show, discontinued, in terms of a report approved of by a General Meeting of the Society on 21st January 1863. Reference is made to General Regulations 37, 38, and 39, for the terms on which Implements may now be exhibited, and the conditions under which they will be tried and rewarded.

REGULATIONS.

GENERAL CONDITIONS.

1. Members of the Society are admitted to the Show-Yard without payment, on exhibiting a "*Member's Ticket*," except during the inspection by the Judges, when 5s. will be charged. Tickets will be sent to all Members residing in the District connected with the Show—the counties of Edinburgh, Haddington, and Linlithgow. Members residing in other localities must apply for Tickets at the Secretary's Office, 3 George IV. Bridge, Edinburgh, *not later than the 25th of July.*

2. Stock must be *bona fide the property and in the possession of* the Exhibitor from the date of the Entry.

3. Each column in the schedule of Entry must be filled up so far as within the knowledge of the Exhibitor.

4. Breeding Stock must not be shown in an improper state of fatness, and the Judges will be prohibited from awarding Premiums to overfed animals.

5. Stallions and aged Bulls must have had produce, and, along with Two-year-old Bulls, have served within the year of the Show.

6. All Cows must have had calves previous to the Show, and when exhibited, they must either be in milk or in calf; if in milk, birth must have been within 9 months of the Show; if in calf, birth must be certified within 4 months after the Show.

7. All Milch Cows must have been milked dry the evening previous to being judged, and they must, while within the Show-Yard, be milked morning and evening. The Judges will be instructed to withhold the prizes from any animals overstrained or suffering from want of being milked.

8. Two-year-old Heifers—of the Short-horn and Polled Breeds—must be in calf when exhibited, and birth must be certified within 9 months after the Show.

9. Mares in Section 5 must have produced foals after 1st January 1869, and foals must be at foot, except when death can be proved. Mares in Section 6 must be in foal, and awards will be suspended till birth is certified.

10. All Ewes must have reared Lambs in 1869; and Ewes in Sections 11 and 15 (Cheviot and Blackfaced) must be in milk, and have their Lambs at foot. Fleeces must not be artificially coloured.

11. The Pigs in Sections 5 and 6 must belong to the same litter, and be uncut.

12. Poultry.—The Aged Birds must have been hatched previous to, and Cockrels and Pullets in, 1869.

13. An animal which has gained a first premium at a General Show of the Society cannot again compete in the same section.

14. First prize animals in the classes of Aged Bulls, Cows, Stallions, and Mares may be shown for the Medium Gold Medal at three consecutive Shows after gaining the first prize.

15. No animal shall bear on its rug, harness, pail, or other fittings, any initial, crest, or mark of ownership, nor be distinguished otherwise than by the number indicating its place in the Catalogue.

16. Except for extra Stock, Commendations will only be given for one lot in each Section—the fourth in merit.

17. The violation by an Exhibitor of any one of the Regulations will involve the forfeiture of all Premiums awarded to him.

18. Should it be proved to the satisfaction of the Directors that an animal has been entered under a false name, pedigree, or description, for the purpose of misleading the Directors or Judges as to its qualification or properties, the case shall be reported to the first General Meeting, in order that the Exhibitor shall be disqualified from again competing at the Society's Shows, and his name, if he be a Member, struck from the roll.

19. When an animal has previously been disqualified by the decision of any Agricultural Association in Great Britain or Ireland, such disqualification shall attach, if the Exhibitor, being aware of the disqualification, fail to state it, and the grounds thereof, in his entry, to enable the Directors to judge of its validity.

20. Protests against the awards of the Judges must be lodged with the Secretary not later than 10 A.M. on Thursday, 29th July, and parties must be in attendance at the Committee-Room, in the Show-Yard, at 12, when protests will be disposed of.

21. The Society shall not be liable for any loss or damage which Stock, Implements, or other articles may sustain at the Show, or in consequence of having been sent to it.

22. The decisions of the Board of Directors are final in all questions respecting Premiums, and it shall not be competent for any Exhibitor to appeal against such decisions to, nor seek redress in respect of them from any other tribunal.

23. The Premiums awarded will be paid after the 1st November 1869, and may be taken either in money or in plate.

CERTIFICATES OF ENTRY FOR STOCK.

24. Every Lot must be intimated by a Certificate of Entry, lodged with the Secretary *not later than Wednesday, the 16th of June.* Printed forms will be issued on application to the Secretary, No. 3 George IV. Bridge, Edinburgh.

25. Admission-Orders to the Yard for Stock and Servants will be forwarded by post previous to the Show.

STALL RENT.

26. Covered accommodation will be provided for the whole of the Stock, and the following rates shall be paid by Exhibitors at the time of making their Entries :—

	Members.		Non-Members.	
	s.	*d.*	*s.*	*d.*
Stallions—3 and 2 year old entire Colts, .	15	0	25	0
All other Horses and Cattle, . . .	10	0	20	0
Sheep and Swine, per pen, . . .	8	0	15	0
Poultry, per coop, . .	1	6	2	6

ADMISSION OF STOCK.

27. The Yard will be open for Stock on Monday, 26th July, and Tuesday 27th July, and between Six and Eight o'clock on the morning of Wednesday the 28th July, after which hour no Stock can be admitted.

28. One Servant will be admitted in charge of each Lot. Bulls must be secured by a nose ring, with chain or rope attached.

29. Cattle, Sheep, or Swine cannot be removed from the Yard till Five P.M. on Friday, 30th July, except on certificate by the Veterinary Surgeon employed by the Directors.

30. Horses may be withdrawn at Six each evening on a deposit of £2 for

each animal, which shall be forfeited if the animal is not brought back at Seven o'clock the following morning.

31. Servants in charge of Stock must bring their own buckets or pails. A first bedding for Horses, Cattle, and Swine, will be provided by the Society, but all other fodder and food for Stock will be supplied, at fixed prices hereafter to be published, by a Contractor employed by the Society. Any Servant removing bedding from an adjoining stall will be fined in double the amount taken. Exhibitors may fetch their own cake or corn to the Yard, but not grass, hay, nor straw.

PLACING AND JUDGING STOCK.

32. On Wednesday, 28th July, Exhibitors, and all others except Servants in charge of Stock, must leave the Yard at Eight A.M. The Judges will commence their inspection at Nine o'clock, when the public will be admitted. There shall be no award unless the Judges deem the animals to have sufficient merit, more especially if there is only one lot in a Section; and it shall be in their power to suggest the removal of any lot which appears to them unworthy of being placed in the Yard.

33. Two Members of Committee will attend each Section of the Judges. It will be their duty to see that no obstruction is offered to them, and that the space reserved for them is not encroached on; to communicate to the Secretary any question that may arise for the consideration of the Committee; to complete their reports; and to ticket the prize animals.

34. It shall not be competent for any Exhibitor, nor for his Factor or Land-Steward, to act as a Judge or Attending Member in any class in which he is competing; and no Exhibitor shall remain in charge of any lot, whether belonging to himself or another, while the Judges are in the Yard.

ADMISSION OF PUBLIC.

35. The public will be admitted to the Stock-Yard on Wednesday at 9 A.M., immediately before the inspection by the Judges commences. Holders of Members' tickets, and Exhibitors of Stock, will be charged 5s. for admission to the judging; all others 10s. The space reserved for the Judges will be enclosed by ropes, and no encroachment will be permitted.

36. After 2 P.M. on Wednesday, Holders of Members' Tickets and Exhibitors will be admitted free. The charges to others will be—Wednesday, after 2 P.M., 2s. 6d.; Thursday, from 8 A.M. till 1 P.M., 2s. 6d., and after 1 P.M., 1s.; Friday, from 8 A.M. till 5 P.M., 1s. The Implement Yard will be open on Wednesday forenoon while the Stock is being judged; holders of Members' Tickets and Exhibitors admitted free; others at 2s. 6d.; thereafter one payment admits to both Yards.

ENTRY OF IMPLEMENTS.

37. All articles must be entered with the Secretary on or before Wednesday, 16th June, and Exhibitors must intimate whether they wish their goods placed under cover or not, and specify the space they require. Shedding will be charged 2s. per lineal foot of frontage, with a depth of 20 feet, to Members, and 3s. to Non-members.

38. Members may show Implements free if shedding is not required, and Non-members will be charged 1s. per lineal foot of frontage, with a depth of 20 feet.

39. When an Implement or Machine is supposed to embrace a new invention, or radical improvement, the nature of such must be specified in the entry, to enable the Directors to order an inspection with a view to a trial. Such trial, when recommended by the inspecting Committee, will be instituted in a convenient locality, and at a season of the year suitable for the operation of the implement or machine, which, when thoroughly tested, will be entitled

to such a Premium as the Directors may see fit to award, on the report of the Judges employed by them.

PLACING IMPLEMENTS IN THE YARD.

40. The Yard will be open for the reception of Implements on Tuesday, 20th July, and till the evening of Tuesday, 27th July.

41. There must be attached to each Implement, when forwarded to the Show, a label bearing the Exhibitor's name, and that of the Implement.

42. The carriage of all Implements must be prepaid.

43. The articles of each Exhibitor will be all placed in one stand.

44. All articles must remain in the Yard till Five P.M. on Friday, the 30th July, and may be kept there till the afternoon of Saturday.

PLACING AND JUDGING POULTRY.

45. Poultry must be brought to the Show-Yard on Tuesday, 27th July, or between Six and Eight o'clock on the morning of Wednesday, 28th July. No lot will be admitted without an Admission-order. Coops, food, and attendance will be found by the Society.

46. No lot to be removed from the Yard till Five P.M. on Friday, the 30th July.

Premium Lists, Certificates of Entry, and Regulations, may be obtained by applying at the Secretary's Office, No. 3 George IV. Bridge, Edinburgh.

All Communications should be addressed to FLETCHER NORTON MENZIES, Esq., *Secretary of the Highland and Agricultural Society of Scotland, No. 3, George IV. Bridge, Edinburgh.*

RAILWAY ARRANGEMENTS.

Implements conveyed by Goods Trains, and Stock in Waggons by Goods Trains, will, if unsold, be returned from the Show free by all the Railways.

LAST DAY OF ENTRY—WEDNESDAY, 16TH JUNE.

GENERAL SHOW OF STOCK AND IMPLEMENTS

At DUMFRIES, 1870.

The District connected with the Show comprises Dumfriesshire, the Stewartry of Kirkcudbright, and Wigtownshire.

Premiums will be offered for the following Classes :—

CATTLE.

GALLOWAY.

Bulls calved before 1st January.....1868
Bulls calved after 1st January 1868
Bulls calved after 1st January 1869
Cows of any age.
Heifers calved after 1st January 1868
Heifers calved after 1st January 1869

POLLED ANGUS OR ABERDEEN.

Bulls calved before 1st January.....1868
Bulls calved after 1st January 1868
Bulls calved after 1st January 1869
Cows of any age.
Heifers calved after 1st January 1868
Heifers calved after 1st January 1869

SHORT-HORN.

Bulls calved before 1st January.....1868
Bulls calved after 1st January 1868
Bulls calved after 1st January 1869
Cows of any age.
Heifers calved after 1st January 1868
Heifers calved after 1st January 1869

AYRSHIRE.

Bulls calved before 1st January.....1868
Bulls calved after 1st January 1868
Bulls calved after 1st January 1869
Cows in milk, calved before 1st January 1867
Cows in milk, calved after 1st January 1867
Heifers calved after 1st January 1868
Heifers calved after 1st January 1869

HIGHLAND.

Bulls calved before 1st January.....1868
Bulls calved after 1st January 1868
Cows of any age.
Heifers calved after 1st January.....1867
Heifers calved after 1st January 1868

FAT STOCK.

Galloway Oxen calved after 1st January 1867
Galloway Oxen calved after 1st January.....1868
Highland Oxen calved after 1st January 1866
Highland Oxen calved after 1st January 1867
Oxen of any other pure or cross breed calved after 1st January...1867
Oxen of any other pure or cross breed calved after 1st January...1868
Galloway Heifers calved after 1st January 1867
Heifers of any other pure or cross breed calved after 1st January 1867

HORSES

For Agricultural Purposes.

Stallions foaled before 1st January.....1867
Entire Colts foaled after 1st January 1867
Entire Colts foaled after 1st January 1868
Entire Colts foaled after 1st January 1869
Mares with foal at foot, foaled before 1st January 1867
Mares in foal, foaled before 1st January 1867
Fillies foaled after 1st January.....1867
Fillies foaled after 1st January.....1868
Fillies foaled after 1st January.....1869

EXTRA HORSES.

Mares or Geldings foaled before 1st January 1865, suitable for field.
Mares or Geldings foaled between 1st January 1865 and 1st January 1866, suitable for field.
Mares or Geldings foaled before 1st January 1866, suitable for carriage.
Draught Geldings foaled before 1st January 1866.
Draught Geldings foaled between 1st January 1866 and 1st January 1867.
Mares or Geldings between 12 and 14 hands high.
Mares or Geldings under 12 hands high.

SHEEP.

LEICESTER.

Tups not above four shear.
Dinmont or Shearling Tups.
Ewes not above four shear.
Shearling Ewes or Gimmers.

BORDER LEICESTER.

Tups not above four shear.
Dinmont or Shearling Tups.
Ewes not above four shear.
Shearling Ewes or Gimmers.

CHEVIOT.

Tups not above four shear.
Dinmont or Shearling Tups.
Ewes not above four shear.
Shearling Ewes or Gimmers.

BLACKFACED.

Tups not above four shear.
Dinmont or Shearling Tups.
Ewes not above four shear.
Shearling Ewes or Gimmers.

SOUTHDOWN AND OTHER SHORT-WOOLLED.

Tups not above four shear.
Dinmont or Shearling Tups.
Ewes not above four shear.
Shearling Ewes or Gimmers.

LONG-WOOLLED OTHER THAN LEICESTER.

Tups not above four shear.
Ewes not above four shear, or Gimmers.

EXTRA SHEEP.

Cheviot Wethers, one shear.
Blackfaced Wethers not above four shear.
Half-bred Hoggs.
Cross-bred Hoggs.

NOTE.—*Ewes, Gimmers, Wethers, and Hoggs to be exhibited in pens of five, and in the Cheviot and Blackfaced Breeds, Ewes must be in milk with lambs at foot.*

SWINE.

Boars, large breed. | Sows, large breed.
Boars, small breed. | Sows, small breed.

Pigs not above 8 months old, large breed.
Pigs not above 8 months old, small breed.

NOTE.—*Pigs to be exhibited in pens of three.*

POULTRY.

Cock and Two Hens, Cockerel and Two Pullets, of each of the following breeds:—

Dorking—Silver-Grey.
Dorking—Coloured.
Dorking—White.
Cochin-China—Coloured.
Cochin-China—White.
Brahmapootra—Pencilled.
Brahmapootra—Light.
Malay.
Spanish.
Scotch Grey.
Hamburg—Golden Pencilled.
Hamburg—Silver Pencilled.
Hamburg—Golden Spangled.
Hamburg—Silver Spangled.
Polish—White-crested Black
Polish—Golden Spangled.
Polish—Silver Spangled.
Game—Black or Brown Reds.
Game—Duckwings.
Game—Any other variety.
Bantams—Game.
Bantams—Gold-laced Sebright.
Bantams—Silver-laced Sebright.
Bantams—Any other variety.
Any other distinct Breed of Poultry.
Ducks—White Aylesbury.
Ducks—Rouen.
Ducks—Any other distinct Breed.
Turkeys—Black Norfolk.
Turkeys—Any other Breed.
Geese—Grey Toulouse.
Geese—Embden.
Geese—Any other Breed.
Capons—(coops of three).

DAIRY PRODUCE.

Cured Butter.
Powdered Butter.
Fresh Butter.
Cheddar Cheese.
Dunlop Cheese.
Sweet Milk Cheese of any other variety.

The Cheeses not to be less than 56 lbs. weight each, and to be made in Scotland.

VETERINARY DEPARTMENT.

The Veterinary College of Edinburgh was established by the Society in 1823, and was conducted by Professor Dick from that date till his death in April 1866. During that time the Society has issued Certificates or Diplomas to 850 Students of the College, who had passed the Examinations instituted by the Board of Directors.

The late Professor Dick at his decease endowed the College, and bequeathed it in trust to the Lord Provost, Magistrates, and Councillors of the City of Edinburgh, continuing to the Society the power to appoint Examiners.

The establishment is now conducted by Professor Williams, assisted by Dr Allan Dalzell, Dr Young, Mr Strangeways, and Mr Worthington. The curriculum embraces the Principles and Practice of Veterinary Medicine and Surgery, with Anatomy, Physiology, and Demonstrations; Cattle Pathology; Chemistry; Materia Medica and Dietetics; and the general management of domesticated Animals.

Students have the advantage of assisting in an extensive practice, and of performing the different operations which most frequently occur.

Attendance on Two Courses is required before a Student can be taken upon trial for Diploma by the Society.

The examinations are conducted by leading members of the Medical Faculty and of the Veterinary Profession; and a Diploma bearing the arms of the Society, and signed by the Examiners, is granted to those Students who pass the required examinations.

Graduates of the College are eligible for appointment as Veterinary Surgeons in Her Majesty's service.

The Session commences in the beginning of November, and is concluded before the end of April following.

AGRICULTURAL EDUCATION.

The following Bye-Laws were enacted in 1866, under the authority of the Supplementary Charter of 1856, and in terms of a Report by the Council on Education adopted January 1865:—

BYE-LAWS.

I. That, in terms of a report by the Council on Education, the following Board of Examiners be appointed:—

Science and Practice of Agriculture—Mechanics and Construction.—Professor Wilson; George Hope, Fenton Barns; Robert Russell, Pilmuir; and John Wilson, Edington Mains.

Botany.—Professor Balfour.

Chemistry.—Professor Anderson.

Natural History.—Professor Allman.

Veterinary Surgery.—Professor Williams.

Field Engineering and Surveying.—Professor Macquorn Rankine and David Stevenson, C.E.

Book-Keeping and Accounts.—Kenneth Mackenzie, C.A., and Archibald Paterson, Meadowfield.

II. That the examination shall be both written and oral; that the value of the answers shall be determined by numbers; and that the oral examination shall be public.

III. That there shall be two examinations, to be styled respectively the "Certificate Examination," and the "Diploma Examination." The first to be open to candidates not less than eighteen years of age; the second to those who have completed twenty-one years.

IV. That to pass the "Certificate Examination" a candidate must be acquainted with farm accounts, mensuration, and surveying, and must possess a good knowledge of practical agriculture, and a general acquaintance with the elements of botany, chemistry, and natural history.

V. That a certificate in the following terms, signed by the President or Vice-President of the Council on Education, and by the Secretary, shall be granted to candidates passing this examination:—

"We hereby certify that on the A. B. was examined, and has been found to possess a knowledge of farm accounts, mensuration, and surveying, a good knowledge of practical agriculture, and a general acquaintance with the elements of botany, chemistry, and natural history, and that he is therefore entitled to present himself for the further examination, in terms of the regulations, for the Society's diploma."

VI. That to pass the "Diploma Examination" a candidate must be in possession of the certificate, and have attained his twenty-first year, and must be found to possess a thorough knowledge of the theory and practice of agriculture; of mechanics and mensuration; of the physiology and treatment of domesticated animals; and of the application of botany, chemistry, and natural history to agriculture.

VII. That a diploma in the following terms, bearing the corporate seal of the Society, and signed by the President or Vice-President of the Council on Education, and by the Secretary, shall be granted to candidates passing the second examination :—

"These are to certify that, on the day of A. B. was examined in the arts and sciences connected with agriculture, and has been reported to be proficient therein by a Board of Examiners nominated by the Council of the Highland and Agricultural Society of Scotland on Education, in terms and by authority of a Charter, given under the Great Seal, on the 18th day of August 1856."

VIII. That a sum not exceeding L.100 per annum shall be placed at the disposal of the Examiners, to be applied in prizes to candidates who pass with distinguished merit, and on a standard exceeding that required for the diploma.

The following Gentlemen have passed Examinations :—

For Diploma.

1. Jacob Wilson, Woodhorn Manor, Morpeth, . . . 1858.
2. John Milne, Mains of Laithers, Turriff, ... 1859.
3. William Henry Eley, Cobham, Kent, ... 1859.
4. Thomas Rome, Groundslow, Staffordshire, . . . 1859.
5. William Norman, Ouchterside, Carlisle, ... 1860.
6. George Campbell, Balbrogie, Coupar-Angus, . . . 1861.
7. William B. Smith, Stoneleigh Villa, Leamington, . . 1862.
8. John R. Hetherington, Carlisle, ... 1862.
9. William Brown, jun., Edderstone, Peebles, . . . 1864.
10. Arthur James Hill, Bath, ... 1864.

For Certificate and Diploma

(*Under Bye-Laws enacted in* 1866).

11. R. H. Goddard, Newcastle-on-Tyne, ... 1866.
12. G. Y. Wall, jun., Durham, ... 1866.
13. Robert Brydon, Burncastle, Berwickshire, . . . 1867.
14. George Kent Walton, Long Campton, Warwickshire, . 1867.
15. Thomas John Elliot, Wilton, Salisbury, ... 1868.

For Certificate

(*Under Bye-Laws enacted in* 1865).

1. J. C. Bowstead, Halkthorpe Hall, Penrith, . . . 1867.
2. Thomas John Elliot, Wilton, Salisbury, ... 1867.
3. James Taylor, Allan Vale, Pitmuxton, ... 1868.

CHEMICAL DEPARTMENT.

The objects of the Chemical Department are threefold :—

I. The prosecution of researches in various subjects connected with Agricultural Chemistry, the results of which are published at intervals in the Transactions.

Dr Anderson will be glad at all times to receive suggestions from Members of the Society regarding subjects they may consider worthy of investigation, and which will be laid before the Chemical Committee.

II. To assist in the performance of minute and accurate Field Experiments.

For this purpose it has recently been resolved to institute field experiment on a systematic plan, and in such a manner as to obtain exact and comparable results. The experiments will be conducted in different districts under the superintendence of a Committee, who will fix the precise nature of those to be made in each year, and see that the precautions required to secure accuracy are properly attended to. The furnishing the requisite chemical data for these researches will in future form an important part of the business of the laboratory. Gentlemen who have any suggestions to make regarding subjects deserving investigation are requested to communicate with Dr Anderson.

III. The performance of Analyses of Manures, Soils, Vegetable Products, &c., for Members of the Society at reduced fees.

In purchasing manures, cattle foods, &c., Members are recommended, in all cases, to do so by guaranteed analyses, and to ascertain that the article delivered corresponds with it. Partial analyses, such as No. 6 and 7 of the accompanying list, will generally suffice to check the correspondence of the stock with the guarantee, and give an *approximate* though not a precise estimate of its value. When an *exact* estimate is required, a complete analysis is necessary.

Samples intended for analysis should be sent (carriage paid) addressed to Dr Anderson, 15 Shuttle Street, Glasgow, and when of small size, they are most cheaply and expeditiously forwarded *by post.* They should be distinctly labelled, marked with the name and address of the sender in full, and accompanied by a letter, specifying the particular analysis required, according to its number in the following list,—and, if possible, the object in view,—as, by doing so, much trouble and delay will occasionally be saved.

Some inconvenience having been experienced by persons sending

samples for Analysis which had not been selected with sufficient care, and were afterwards found not to represent the average composition of the substance, it is particularly requested that the following instructions may be attended to as closely as circumstances will permit.

INSTRUCTIONS FOR SELECTING SAMPLES FOR ANALYSIS.

Manures.—A large double handful of the Manure should be taken from each of *at least* five or six different bags; and if any lumps are found in it, a due proportion of these should also be taken. The whole being laid on a large sheet of paper, should be carefully mixed by rubbing with the hand, the lumps being broken down and mixed as uniformly as possible with the powdery part. If this mixture be carefully made, a quantity of it not exceeding *two ounces* will suffice for the analysis. It should be folded up in tinfoil to prevent its becoming dry. In default of tinfoil, the sample may be wrapped in double folds of strong writing paper. Should the manure contain stones, or be very moist, or should any difficulty be experienced in making a uniform mixture, it is desirable that *two or three pounds* should be sent.

Soils.—In selecting Soils for analysis, five or six spadefuls should be taken from different parts of the field, and after being spread out in a thin layer for several days to dry, should be put two or three times through a fine sieve, so as to ensure uniform mixture. For a complete analysis, not less than *two pounds* should be sent; for a partial analysis, three or four ounces will be sufficient.

Waters.—For the complete analysis of a Water, from *two to three gallons* are required; for the determination of the amount of salts in solution, and lime thrown down by boiling, *two quarts* will suffice. A well water may be selected at any time; but the water of a spring or running stream should be taken in dry weather. The jars or bottles in which they are sent must be tightly corked and sealed. In the analysis of a mineral water, it may sometimes be desirable to determine the amount of gases held in solution; in which case certain precautions must be observed which require the presence of a chemist at the spring.

Limestones, Clays, Ironstones, &c.—If the bed of any of these substances of which the analysis is required be very uniform in appearance, a piece of two or three ounces weight taken from any part of it will be enough for analysis; but in all cases, it is better to send three or four chips from different parts of its thickness. Sometimes, where the character of different parts of the bed vary much, separate analysis of these portions may be requisite, in which case two ounces of each may be sent.

The following are the rates at which analyses, &c., are furnished to *Members of the Society*, and it is requested that the fee be remitted along with the sample :—

1. Complete analysis of a Soil, including determination of Alkalies and Phosphates, L3.
2. A partial analysis of a Soil, such as the determination of the quantity of Organic Matter, and relative proportion of Clay, Sand, and Carbonate of Lime it contains, 10s.

3. Quantitative determination of any one ingredient of a Soil, 7s. 6d.
4. Complete analysis of Saline Manures and other substances, such as Gypsum, Nitrates of Soda and Potash, Ammoniacal Salts, Guano, Oil-cake, Bone-dust, Rape-dust, Superphosphate of Lime, L.1.
5. Testing the above substances for adulterations—for each sample, 5s.

   This exanination is generally sufficient to determine whether or not any of these substances are grossly adulterated, but it gives no idea of the comparative value of different Samples, where all are genuine.
6. Determination of the percentage of Phosphates and Ammonia in a Guano, 10s.
7. Determining the Quality of Soluble and Insoluble Phosphates in a Superphosphate, 10s.

   This and the proceeding determination generally suffice to show whether the sample is of fair quality, and corresponds with the analysis by which it was sold, but not to fix its exact commercial value.
8. Complete analysis of Limestone, Marl, Shell-sand, &c., L.1.
9. Examining any of the above substances for the quantity of Lime, and ascertaining in the same the presence of Magnesia and Alumina, 7s. 6d.

   Ascertaining the proportion of these, 2s. 6d. additional for each substance.
10. Complete analysis of the Ash of any Plant, L.3.
11. Complete analysis of a Water, L.2.
12. Determination of the Amount of Salts in Solution, and of the Lime thrown down by boiling in any water, 10s.
13. Analysis of Tile or Fire Clay, L.1, 10s.
14. Complete analysis of Roots, Grains, and other Vegetable Products, L.1.
15. Examining products of Vegetation, or of the Dairy, such as Nutritive Matters in Wheat, or other grain—quantity of Butter or Cheese in Milk—5s. for each ingredient.
16. Determination of the quantity of Nitrogen in any substance, 7s. 6d.
17. Answers to letters asking advice on subjects within the department of the chemist, 5s.

The charges for other Analyses not specified in the list will be settled by the Committee of Management, with reference to the amount of work which they involve, and on a scale similar to the above.

F. N. MENZIES, *Secretary.*

EDINBURGH, *February* 1869.

LIST OF MEMBERS

OF

THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND,

1869,

ALPHABETICALLY ARRANGED, AND DISTINGUISHING THE YEAR OF ADMISSION.

The Members marked * have been Presidents ; and † Vice-Presidents.

New Members are admitted at the Half-Yearly General Meetings in January, and in June or July. The ordinary subscription is £1, 3s. 6d. annually, which may be redeemed by one payment, varying from £12, 12s. to £7, 1s., and regulated by the number of previous annual payments. Tenant Farmers, Secretaries and Treasurers of local Agricultural Associations, resident Agricultural Factors, and Proprietors farming the whole of their own lands, whose assessment on the valuation-roll does not exceed £500, are admitted on a subscription of 10s. annually, which may be redeemed by one payment, varying according to the number of previous annual payments, from £5, 5s. to £3.

LIST OF MEMBERS.

Admitted

His Majesty NAPOLEON III., Emperor of the French, *Honorary Associate.* 1856

His Royal Highness The PRINCE OF WALES, *Honorary Member.* 186

Admitted

1844*ARGYLL, His Grace the Duke of, K.T.
1860 ATHOLE, His Grace the Duke of
1841 ATHOLE, Her Grace the Duchess Dowager of
1833 ABERCORN, His Grace the Duke of, K.G.
1847 AILSA, Most Noble the Marquis of, K.T.
1852†AIRLIE, Right Hon. Earl of, K.T.
1868 ABERDEEN, Right Hon. the Earl of
1833 ARBUTHNOTT, Right Hon. Viscount
1862 ABERCROMBY, Right Hon. Lord
1865 ABINGER, Right Hon. Lord
1864 ARBUTHNOTT, Hon. Mrs, Inchmartine
1853 ARDMILLAN, Hon. Lord
1850 AGNEW, Sir Andrew, of Lochnaw, Bart.
1850 ABERCROMBY, Sir Geo. S., of Birkenbog, Bart.
1862 ANSTRUTHER, Sir Robert, of Balcaskie, Bart., M.P.
1829 ANTROBUS, Sir E., of Rutherford, Bart.
1852 ARBUTHNOT, Sir Robert Keith, Bart.
1831 ALEXANDER, Sir J. Ed. of Westerton.
1852 AITCHISON, Gen. Sir J., K.C.B., G.C.B.
1838 ANDERSON, Sir A., of Blelack, Aberdeen
1859 Adam, Alexander Forsyth, W.S., Edinburgh
1862 Adam, Alexander, of Lynegar, Wick
1855 Adam, Æneas, Humbertson, Dingwall
1842 Adam, James, S.S.C., Edinburgh
1860 Adam, John, Closeburn, Thornhill
1856 Adam, Stephen, Wool-Merchant, Leith
1839 Adam, William, Advocate, Aberdeen
1853 Adam, W. Patrick, of Blair-Adam, M.P.
1860 Adams, John, S.S.C., Edinburgh
1859 Adamson, S., of Drumclyre, Dumfries
1844 Addie, Robert. of Viewpark, Uddingston
1859 Adie, Alexander James, Linlithgow
1843 Agnew, R. Vans, of Sheuchan, Barnbarroch, Wigtown
1857 Aikman, Thomson, Glasgow
1864 Ainslie, Daniel, of the Gart, Callander

Admitted

1859 Ainslie, David, of Costerton, Blackshiels
1848 Ainslie, J., Hillend, Pentland, Loanhead
1853 Ainslie, R., of Elvingston, Gladsmuir
1857 Ainslie, William, Moat, Roslin
1851 Aitchison, James, late Proney Mains, Dornoch
1865 Aitchison, Lieut.-Col., of Drummore, Musselburgh
1835 Aitchison, Wm., Linhope, Hawick
1863 Aitchison, W., jun., Linhope, Hawick
1861 Aitken, George, Tyrie, Kirkcaldy
1857 Aitken, James, Cranstonhill, Glasgow
1854 Aitken, James, Sunnyside, Prestonkirk
1864 Aitken, John Gillespie, Stirling
1857 Aitken, Robt., Drumore, Campbeltown
1860 Aitken, Thos., 6 Windsor St., Edinburgh
1854 Aitken, Thomas, Listonshiels, Balerno
1855 Aitken, Wm., Chapel Colliery, Wishaw
1856 Alexander, C., Whitefield, West Linton
1862 Alexander, Lt.-Col. C., of Ballochmyle, Mauchline
1857 Alexander, Eben., Taylortown, Stirling
1857 Alexander, Jas., Seed Merchant, Edin.
1842 Alexander, J., of Balmule, Dunfermline
1855 Alexander, John, Broughty Ferry
1865 Alexander, Capt. John, of Southbar, R.N., C.B.
1861 Alexander, Thos., Corn Factor, Perth
1858 Alexander, Wm., Bent of Haulkerton, Laurencekirk
1865 Alison, James M., Lettoch, Killearnan
1854 Alison, Thos., of Calder Mill, Carstairs
1833 Allan, Alexander, Advocate, Edinburgh
1853 Allan, Alexander, Drummond, Evanton
1861 Allan, Alex., West Park, Auchterarder
1864 Allan, Alexander, Carbarns, Wishaw
1867 Allan, Andrew, Munnoch, Dalry
1847 Allan, Lieut.-Colonel, Edinburgh
1851 Allan, James, Clifton Mains, Ratho
1855 Allan, James, Clauchan, Arran
1852 Allan, James, West Mains, Stonehouse
1863 Allan, James D., Culthill, Dunkeld
1854 Allan, John, Billie Mains, Ayton
1861 Allan, John, Crieffvecter, Crieff

Admitted
1863 Allan, Richard, Howden, Jedburgh
1863 Allan, Robert A., Greenburn, Ayton
1853 Allan, Thomas, Fogorig, Dunse
1852 Allan, Thomas William Murray, of Glenfeochan, Oban
1830 Allan, William, Edinburgh
1815 Allen, James, Merchant, Glasgow
1858 Allman, George James, M.D., Professor of Natural History, University of Edinburgh
1864 Alston, Geo., of Craighead, Hamilton
1850 Alston, Jn. P., of Muirburn, Strathaven
1863 Amos, Thomas, Earlside, Hawick
1866 Anderson, B. T. G., of Tushielaw, Selkirk
1844 Anderson, A. D., M.D., Glasgow
1825 Anderson, D., of Moredun, Edinburgh
1829 Anderson, David, of St Germains, Prestonpans
1858 Anderson, David, North Mains of Ethie, Arbroath
1839 Anderson, George, Solicitor, Inverness
1844 Anderson, George, M.P., Glasgow
1862 Anderson, George, of Woodhouse, Kirtlebridge
1863 Anderson, George, Broomhill, Selkirk
1859 Anderson, George B., Meikle Pinkerton, Dunbar
1857 Anderson, Henry, of Chapel, Kirkcaldy
1861 Anderson, Henry, Burnside, Stanley
1839 Anderson, J., late of Gorthlick, Inverness
1838 Anderson, James, Wickham, Gateshead
1863 Anderson, James, Newbigging, Dundee
1865 Anderson, James, Solicitor, Inverness
1838 Anderson, John, Merchant, London
1838 Anderson, John, Merchant, Glasgow
1857 Anderson, John, Craigton, Banchory
1868 Anderson, John, Mill of Wester Coull, Tarland
1857 Anderson, John, Pratis, Largo
1859 Anderson, John, Smithston, Kilsyth
1860 Anderson, Jn., Braes of Foss, Pitlochry
1851 Anderson, Lawrence, Chapel, Moffat
1869 Anderson, Lawrence, Sunnybrae, Saline
1864 Anderson, Peter, Gillespie, Glenluce
1856 Anderson, Robert, of Lochdu, Nairn
1861 Anderson, Robt. H., Burleigh, Kinross
1850 Anderson, Robert Hood, Glasgow
1858 Anderson, Robt. Wm., Clerk of Supply, Forfar
1849 Anderson, Stephen, late of Carfin
1832 Anderson, Thomas, of Glendrisaig, Kilmarnock
1849 Anderson, T., M.D., Professor of Chemistry, University of Glasgow, Chemist to the Society
1854 Anderson, T. Scott, W.S., Edinburgh
1865 Anderson, William, Ballimore, Tigh-na-bruaich
1867 Anderson, W. H., Pitcorthie, Anstruther
1857 Anderson, Wm., Hattonburn, Banchory
1840 Anderson, William James, late of Techmuiry

Admitted
1857 Andrew, Hugh, Keprigan, Campbeltown
1863 Angus, John, jun., Whitefield, Morpeth
1868 Annand, John, Inverurie
1858 Anton, James, Coltfield, Forres
1844 Arbuthnot, George Clerk, of Mavisbank, Loanhead
1829 Arbuthnot, T., of Meethill, Peterhead
1813 Arbuthnott, J. C., of Balnamoon, Brechin
1855 Archbald, Thomas, Carrington Mains, Lasswade
1846 Archer, Andrew, Jordanstoun, Meigle
1864 Archer, Thomas, Ramly Lodge, Lymington, Hants
1861 Archibald, James, Jamestown House, Monastereran, Ireland
1849 Archibald, John, Duddingstone, South Queensferry
1853 Arklay, John, Gorthlick, Inverness
1861 Arklay, Robt., of Ethiebeaton, Dundee
1850 Arkley, R. H., Inchbrayock, Montrose
1854 Armour, Alex. B., Meiklehill, Kirkintilloch
1860 Armstrong, James, Effgill, Langholm
1862 Arnot, David, Adamston, Auchterhouse
1865 Arnott, Thomas R. (Arnott Brothers & Co.), Liverpool
1862 Arras, Walter, Fodderty, Dingwall
1865 Arres, Wm., Wester Delnies, Nairn
1858 Arundell, W. F. H., of Barjarg, Dumfries
1845 Askew, Henry Wm., Coinshead Priory, Penrith
1863 Askew, W., of Pallinsburn, Coldstream
1851 Austin, R. S., late Middleton, Muthill
1849 Aytoun, James, Advocate, London
1844 Aytoun, Roger S., of Inchdairnie, M.P., Kirkcaldy

1828 *Buccleuch and Queensberry, His Grace the Duke of, K.G.
1835 Buccleuch and Queensberry, Her Grace the Duchess of
1869 Bute, Most Noble the Marquis of
1863 Bowmont, Most Noble the Marquis of
1843 †Blantyre, Right Hon. Lord
1857 †Binning, Right Hon. Lord
1854 Boyle, Hon. George Frederick
1852 Bruce, Hon. Thomas Charles
1839 Baillie, Right Hon. Henry James, of Redcastle
1834 Burnett, Sir Jas. Horn of Leys, Bart.
1864 Bruce, Sir Wm. C., of Stenhouse, Bart.
1858 Bannerman, Sir Alex., of Crimonmogate, Bart.
1843 Baird, Sir Jas. Gardiner, of Saughton Hall, Bart.
1850 Blair, Sir Edward Hunter, of Blairquhan, Bart.
1860 Baird, Sir David, of Newbyth, Bart.
1847 Baillie, Sir Wm., of Polkemmet, Bart.
1848 Boswall, Sir George Houstoun, of Blackadder, Bart.
1843 Baxter, Sir David, of Kilmaron, Bart.

Admitted
1818 Baikie, James, of Tankerness, Kirkwall
1824 Baillie, Evan, of Dochfour, Inverness
1865 Baillie, Evan, P. M., younger of Dochfour, Inverness
1851 Baillie, James William, of Culterallers, W.S., Biggar
1865 Baillie, John Menzies, C.A., Edinburgh
1865 Baillie, John B., of Leys, Inverness
1864 Bain, James, New Grange, St Andrews
1864 Bain, Edwin Sandys, of Livelands, Stirling
1868 Baird, Arthur E., Croftenloan, Pitlochrie
1844 Baird, Charles J., late Manager Shotts Iron Works
1838 Baird, George, of Strichen, Aberdeen
1838 Baird, James, of Knoydart, Cambusdoon, Ayr
1838 Baird, John, of Ury, Stonehaven
1844 Baird, Wm., Grain-Merchant, Glasgow
1863 Balfour, Arthur J., of Whittingham, Prestonkirk
1846 Balfour, Chas., of Balgonie, Markinch
1843 Balfour, David, of Balfour and Trenabie, Kirkwall
1857 Balfour, Major Fras. W., of Fernie Castle, Ladybank
1842 Balfour, James, Letham, Leven
1839 Balfour, John, of Balbirnie, Markinch
1839 Balfour, John Hutton, M.D., Prof. of Botany, University of Edinburgh
1849 Balfour, Major-General, of Arbigland, Dumfries
1844 Balfour, William, of Birstane, Kirkwall
1832 Ballantyne, James, of Holylee, Innerleithen
1860 Ballantyne, Jn. ,jun., Seedsman, Dalkeith
1852 Ballantyne, Thos., Whitehope, Selkirk
1851 Ballingall, Neil, Bingartree House, Leslie
1859 Ballingal, Wm., Sweetbank, Markinch
1853 Ballingall, Robert, Eallibus, Islay
1857 Ballingall, D., Factor, Blairdrummond
1860 Ballingall, George, Melrose
1861 Ballingall, John, Dunbog, Newburgh
1863 Balmer, T., Gordon Castle, Fochabers
1862 Bankes, Meyrick, of Letterewe, Dingwall
1859 Barbour, G. F., of Bonskeid, Pitlochrie
1846 Barbour, T., of Dalshangan, Carsphairn
1848 Barclay, A. Hay, of Paris, Perthshire
1858 Barclay, Charles A., Aberdour House, Fraserburgh
1855 Barclay, George, Davochbeg, Golspie
1858 Barclay, G., Yonderton, King Edward
1834 Barclay, George Robertson, of Keavil, Dunfermline
1862 Barclay, J. W., Auchlossan, Lumphanan
1847 Barclay, Col. P., 14 Coates Cres., Edin.
1859 Barclay, Robert, Drums, Falkland
1855 Barclay, Thomas, Montrose
1865 Barclay, Thomas, Skelbo, Dornoch
1859 Bardner, James, Chesterstone, Largo
1839 Barker, Thomas, Sydney, Australia

Admitted
1862 Barr, James, jun., Whiteshaw, Carluke
1851 Barr, John, Harperland, Kilmarnock
1863 Barrie, Jas., Harden Mains, Jedburgh
1857 Barron, George, Pittenkerie, Banchory
1868 Barry, William, Inchgarth, Forfar
1846 Barstow, Charles M., C.A., Edinburgh
1867 Bartholomew, Hugh, Dalmarnock Road, Glasgow
1855 Bartholomew, James, Duntarvie, Winchburgh
1838 Bartholomew, R., Merchant, Glasgow
1865 Bateson, Samuel S., Cambusmore, Golspie
1861 Bathgate, James, Bower House, Lauder
1854 Baxter, Edmund, W.S., Edinburgh
1858 Baxter, Geo., Craigforthie, Keith Hall
1828 Bayley, Isaac, of Manuel, Edinburgh
1864 Bayne, John, Bridge of Allan
1862 Bayne, William, Foodie, Cupar-Fife
1865 Beach, Joseph, Flour Mills, Dudley
1868 Beath, David, Auchmuir, Leslie
1854 Beattie, James, Newbie House, Annan
1858 Beattie, Peter, Dunnydeer, Insch
1864 Begbie, Alex., Barneyhill, Dunbar
1852 Begbie, Thos., Queenston Bank, Drem
1862 Begg, David, of Canons Park, Edgeware, London
1858 Begg, John, Distiller, Balmoral, Crathie
1857 Beith, John, Grain-Dealer, Rothesay
1849 Belfrage, G., 98 Lauriston Place, Edinburgh
1849 Belfrage, Jas., Samuelston, East Mains, Haddington
1867 Bell, Alexander, Linton, Kelso
1868 Bell, Alexander, Stobahill, Lockerbie
1856 Bell, David, Todhall, Cupar-Fife
1835 Bell, G. Graham, of Crurie, Advocate
1863 Bell, James, Woodhouselees, Canonbie
1859 Bell, J., Glenduckie, Newburgh, Fife
1839 Bell, John, of Enterkine, Tarbolton
1846 Bell, R., of Lunna, Sher.-Sub., Falkirk
1856 Bell, Thomas, Ballinshoe, Kirriemuir
1865 Bell, Thomas, Glentarkie, Strathmiglo
1855 Bell, William, Whitfield Place, Edin.
1858 Benton, Joseph, Cattie, Whitehouse
1858 Benton, William, Harthill, Whitehouse
1869 Berry, George, Longleat, Wiltshire
1848 Berry, John, of Tayfield, Newport, Fife
1863 Berry, Walter, 16 Carlton Ter., Edin.
1860 Bertram, George, Engineer, W. Sciennes, Edinburgh
1864 Bertram, James, Addinston, Lauder
1854 Bertram, John S., Cranshaws, Dunse
1845 Bertram, T. Hardy, Engineer, London
1852 Bertram, William, of Nisbet, Biggar
1861 Berwick, David, Collairnie, Cupar-Fife
1857 Bethune, Admiral, of Balfour, C.B., Markinch
1848 Bethune, Alex., of Blebo, Cupar-Fife
1863 Bethune, Maj. R., of Nydie, St Andrews
1864 Bethune, Murdo, Dreim, Beauly
1861 Bett, David J., Flatfield, Coupar-Angus
1857 Bett, James, Easdale, Oban

Admitted
1859 Beveridge, David, Buckthorn, Largo
1862 Beveridge, George, Orrock, Burntisland
1851 Beveridge, J., Easter Balado, Kinross
1869 Beveridge, Jas., Crombie, Dunfermline
1853 Beveridge, Robert E., Urquhart, Dunfermline
1862 Beveridge, Wm., Orrock, Burntisland
1858 Biggar, T., of Chapelton, Haugh of Urr
1859 Binnie, John, Eshiels, Peebles
1847 Binnie, R., Seton Mains, Longniddry
1849 Binning, John, Brae, Dingwall
1865 Binny, Graham, W.S., Edinburgh
1868 Binny, John, W.S., Edinburgh
1858 Bird, James B., Fishwick, Paxton
1867 Birkett, J., of Broom Rigg, Ainstable, Penrith
1862 Bisset, the Ven. Archdeacon, of Lessendrum, Huntly
1869 Bisset, W. A., 72 Broughton Street, Edinburgh
1846 Black, Adam, 38 Drummond Place, Edinburgh
1856 Black, Alex., Civil-Engineer, Falkirk
1865 Black, Alex., North Navey, Meigle
1850 Black, David, Barrelwell, Brechin
1851 Black, James, London
1838 Black, James, Merchant, Glasgow
1852 Black, James, Knock, Keith
1857 Black, Jas. W., Wandelmill, Abington
1851 Black, John, of Tilliwhally, Kinross
1859 Black, John, Seton Hill, Longniddry
1859 Black, John, Westfield, Coldstream
1844 Black, Robert, Glasgow
1867 Black, Robert, Liberton Mains, Liberton
1842 Blackburn, Peter, of Killearn, Drymen
1846 Blackburn, Robert B., Advocate, Sheriff of Stirlingshire
1865 Blackie, John, junior, Glasgow
1855 Blackley, John, Glasgow
1857 Blacklock, Adam, Minnygap, Moffat
1842 Blackwood, John, Publisher, Edinburgh
1862 Blackwood, William, Publisher, Edin.
1864 Blair, Alexander, Brewer, Alloa
1864 Blair, Campbell, Argyle Street, Glasgow
1849 Blair, Col. Stopford, of Penninghame, Newton-Stewart
1860 Blair, James, of Glenfoot, Tillicoultry
1864 Blair, James, Rowardennan, Luss
1864 Blair, John, Torwoodhead, Stirling
1817 Blair, Wm., of Avontoun, Linlithgow
1844 Blair, Captain William Fordyce, of Blair, R.N., Dalry
1836 Blandow, M. Von, St Petersburg, Hon. Associate
1836 Blane, Colonel Robert, C.B.
1847 Blanshard, George, Merchant, Edin.
1861 Blues, Andrew A., Dalruscan, Tinwald, Dumfries
1861 Blyth, D., Leckiebank, Auchtermuchty
1860 Bogie, Alex., of Newmill, Cupar-Fife
1864 Bogie, James, Newport, Fifeshire
1851 Bogie, J., Balcanquhall, Auchtermuchty

Admitted
1861 Bogie, William, Balneil, Colinsburgh
1854 Bolam, John, Glororum, Belford
1863 Bolam, John, jun., Chathill, Northumberland
1866 Bolam, Robert George, Weetwood Hall, Wooler
1858 Bolton, Joseph C., of Carbrook, Falkirk
1824 Bonar, Andrew, Australia
1867 Bone, Quinton, Grenan, Maybole
1853 Bontine, Wm. Cuninghame Graham, of Gartmore
1842 Booth, James Godfrey, Seed Merchant, Hamburg
1862 Borland, Robt., Auchencairn, Closeburn
1859 Borthwick, Alex. Hay, St Dunstan's, Melrose
1854 Borthwick, Gilbert, Cowbog, Kelso
1863 Borthwick, John, Greenlees, Kelso
1858 Borthwick, John, V.S., Kirkliston
1846 Borthwick, John, of Crookston, Gorebridge
1859 Borthwick, John James M., Georgefield, Langholm
1838 Borthwick, Thomas Chalmers, Hopsrig, Langholm
1857 Borthwick, Wm. Henry, late Crookston, Gorebridge
1865 Borthwick, Wm., Whitehaven Castle, Whitehaven
1864 Borton, John, Barton House, Malton
1861 Bosomworth, John, Abernethy
1863 Bowhill, James, Banker, Ayton
1854 Bowie, Alex., Mains of Kelly, Arbroath
1858 Bowie, Peter, Carlogie, Carnoustie
1859 Bowman, James, Newark, Pittenweem
1853 Boyd, James B., St Boswells Bank, St Boswells
1861 Boyd, John B., of Cherrytrees, Kelso
1865 Boyd, Major James Hay, of Townend, Symington
1863 Boyd, Wm. B., Ormiston, Kirkbank, Kelso
1835 Boyle, Patrick, of Shewalton, The Knowe, Ayr
1865 Braid, Andrew, Humbie, Kirknewton
1858 Brand, Charles, Mains of Fordoun, Fordoun
1846 Brand, William, Secretary, Union Bank of Scotland
1830 Brander, James, Avoch, Fortrose
1855 Brash, James, Hallyards, Kirkliston
1834 Brebner, James, Advocate, Aberdeen
1865 Brims, James, Thurso
1853 Broad, William, Clifton-hill, Kelso
1868 Broadwood, Thomas, of Fulfordlees, Crowhill, Dunbar
1857 Brockley, Robert M., Gourlaw, Lasswade
1867 Brodie, Dun., of Polder, Bridge of Allan
1859 Brodie, James, Banker, Kirriemuir
1848 Brodie, James, Thorntonloch, Dunbar
1840 Brodie, J. Clerk, of Idvies, W.S., Edin.
1821 Brodie, William, of Brodie, Forres

Admitted
1864 Brody, Geo., 49 Minto St., Edinburgh
1855 Broomfield, Thomas, Lauder
1867 Bromfield, W. J., Old Greenlaw, Dunse
1854 Broughton, Robert Henry, of Rowchester, Greenlaw
1863 Brown, Adam, Helmburn, Selkirk
1844 Brown, Alex. J. Dennistoun, of Balloch, Dumbarton
1867 Brown, Alexander, Manor, Peebles
1852 Brown, Andw., M.D., late Edinburgh
1858 Brown, Archibald, Craig, Udny
1866 Brown, David, Banker, Maybole
1839 Brown, George, Watton Mains, Wick
1851 Brown, George, Balgarvie, Cupar-Fife
1858 Brown, George, Westerton, Fochabers
1860 Brown, James, Hargrave, Annan
1849 Brown, James, of Orchard, Carluke
1865 Brown, James, Whinpark, Kilmarnock
1861 Brown, James, Clephanton Cottage, Anstruther
1855 Brown, Jas., Liberton Mains, Carnwath
1837 Brown, James T., of Auchlochlan, Lesmahagow
1856 Brown, John, Outerston, Gorebridge
1857 Brown, John, Boghall, Biggar
1860 Brown, John, Inglistone, Irongray, Dumfries
1852 Brown, John George, Cluny Cottage, Pitlochrie
1860 Brown, J. C., Bridekirk Mains, Annan
1832 Brown, Matthew, Greenock
1861 Brown, Oliphant, Glenlee, New Galloway
1856 Brown, Peter, Craigton, Bishopton
1856 Brown, Robert, Auctioneer, Balfron
1866 Brown, Robert, Bankhead, Midmar, Aberdeen
1866 Brown, Robert E., Wass, Oswald Kirk, Yorkshire
1849 Brown, Thos., Slipperfield, West Linton
1863 Brown, Thomas, Holm, Thornhill
1863 Brown, Thomas, Ruletownhead, Bonchester Bridge
1863 Brown, Thomas, Secretary, Agricultural Society, Campbeltown
1854 Brown, Walter, of Colton, Dunfermline
1855 Brown, Dr William, Melrose
1828 Brown, William, Merchant, Glasgow
1835 Brown, William, Banker, Maybole
1854 Brown, William, Linkwood, Elgin
1861 Brown, William, Factor, Invercauld
1868 Brown, W., jun., of Parkend, Saltcoats
1833 Brown, Wm. Henry, of Ashley, Ratho
1868 Bruce, Alexander, Millhill, Mintlaw
1858 Bruce, A., Wealtherton of Keig, Whitehouse
1817 Bruce, C. L. Cumming, of Roseisle and Kinnaird
1862 Bruce, Charles, Broadland, Huntly
1864 Bruce, George, Veensgarth, Lerwick
1868 Bruce, Geo., Heatherwick, Keith Hall
1865 Bruce, James, Burnside, Fochabers

Admitted
1869 Bruce, James, Longbridgemuir, Annan
1868 Bruce, J., of Inverquhomery, Mintlaw
1829 Bruce, John, of Sumburgh, Zetland
1863 Bruce, J., jun., Sumburgh, Shetland
1842 Bruce, John, W.S., Edinburgh
1865 Bruce, Pr., St Bernard's Cottage, Edin.
1868 Bruce, R., Newton of Struthers, Forres
1855 Bruce, Thomas, of Arnot, Kingsdale, Kennoway
1838 Bruce, Wm., of Symbester, Zetland
1866 Brunton, James, Broomlands, Kelso
1867 Brunton, J. S., Eastfield, St Boswells
1846 Bryce, David, Architect, Edinburgh
1865 Bryce, Jas., East Whitburn, Whitburn
1862 Brydon, Adam, Netherbarns, Galashiels
1864 Brydon, H., Thirlestane Hope, Ettrick
1850 Brydon, James, Kinnelhead, Moffat
1864 Brydon, Jas., jun., Kinnelhead, Moffat
1857 Brydon, John, Mounthooly, Jedburgh
1863 Brydon, Walter, Burncastle, Lauder
1850 Bryson, Robert, Merchant, Glasgow
1852 Bryson, W. G., Cullen House, Cullen
1857 Buchan, Col. Fordyce, of Kelloe, Edrom
1839 Buchan, William, Dolphinton, South Queensferry
1854 Buchanan, A., Whitehouse, Stirling
1857 Buchanan, Alexander, Garscadden, East Kilpatrick
1827 Buchanan, Andrew, of Mount Vernon, Shettleston
1838 Buchanan, Andrew, of Auchintorlie, Dunglass
1849 Buchanan, David Carrick, of Drumpellier, Coatbridge
1853 Buchanan, Dun., Auchenbreck, Colintraive, Greenock
1851 Buchanan, Isaac, Toronto, Canada
1838 Buchanan, James, Glasgow
1838 Buchanan, John, London
1844 Buchanan, J., of Glenlora, Lochwinnoch
1838 Buchanan, John, of Carbeth, Killearn
1857 Buchanan, John, Coldrach, Drymen
1811 Buchanan, Robert, Glasgow
1864 Buchanan, Robert M., Livingston Mill, Mid-Calder
1849 Buchanan, Thomas Gray, of Wellshot, Glasgow
1842 Buchanan, Walter, Glasgow
1828 Buchanan, Wm., Merchant, Glasgow
1863 Buckham, George, Kers Mains, Kelso
1864 Budge, Henry, C.A., Edinburgh
1842 Buist, James, Kirkton Barns, Newport
1848 Buist, Mat., Tynninghame, Prestonkirk
1863 Buist, Robert, Cattle Salesman, Edin.
1865 Bulloch, Ar., Milliken, East Kilpatrick
1863 Burn, John, Ednam, Kelso
1860 Burn, Robert Scott, Highfield Lodge, Heaton Mersey
1824 Burn, William, Architect, London
1854 Burnet, J., Craigielaw, Aberlady, Drem
1867 Burnett, Major-General Francis Claude, of Gadgirth, Coylton

Admitted
1848 Burnett, George, Advocate, Edinburgh
1840 Burnett, Gregory, Dee Cottage, Flint
1834 Burnett, Newell, Advocate, Aberdeen
1858 Burnet, Robert, yr. of Leys, Crathes, Aberdeen
1854 Burroughs, Lieut.-Col. W. F. Traill, of Rolfsea, Orkney
1838 Burnley, W. F., 24 Ainslie Pl., Edin.
1865 Burns, Jas. C., of Glenlee, Hamilton
1865 Burns, J., of Castle Wemyss, Greenock
1867 Burr, Rev. P. Lorimer, Lundie Manse, Dundee
1861 Burns, John William, yr, of Kilmahew, Dumbarton
1859 Bursby, George G., West Fallodon, Chathill
1867 Burton, J. Tait, of Toxside, Gorebridge
1857 Burton, J., Rosewell Mains, Lasswade
1861 Buttar, David, Corston, Coupar-Angus
1825 Butter, Archd., of Faskally, Pitlochrie
1869 Butter, Major Archibald, yr. of Faskally, Pitlochrie
1844 Buttery, A. W., Chapelhall, Airdrie

1847 Crawford and Balcarres, Right Hon. the Earl of
1845†Caithness, Right Hon. the Earl of
1839 Cawdor, Right Hon. the Earl
1851 Colville, of Culross, Right Hon. Lord
1833 Colonsay, Right Hon. Lord
1856 Carnegie, Hon. Charles, M.P.
1824 Craig, Right Hon. Sir William Gibson, of Riccarton, Bart., Treasurer of the Society
1856 Carmichael, Sir William H. Gibson, of Castle-Craig and Skirling, Bart.
1829 Colquhoun, Sir James, of Luss, Bart.
1834 Campbell, Sir Hugh Hume, of Marchmont, Bart.
1838 Cambpell, Sir Jas., of Aberuchil, Bart.
1847 Clerk, Sir James, of Penicuik, Bart.
1834 Cathcart, Sir John Andrew, of Carleton, Bart.
1838 Colebrooke, Sir Thomas Edward, of Crawford, Bart., M.P.
1867 Campbell, Sir Geo., of Succoth, Bart.
1845 Campbell, Sir A., of Barcaldine, Bart.
1838 Campbell, Sir James, of Stracathro, Glasgow
1817 Cochrane, Admiral Sir Thos., G.C.B.
1844 Cadell, Alex. Todd, R.A., Madras
1856 Cadell, Henry, of Grange, Bo'ness
1844 Cadell, Hew Francis, of Cockenzie, Prestonpans
1869 Caird, Alex. M'Neel, Genoch House, Stranraer
1853 Caird, James, of Cassencarie, Creetown
1857 Cairns, Geo., 35 George IV. Br., Edin.
1864 Cairns, James, Dollar Bank, Dollar
1861 Cairns, William, Ballinloan, Dunkeld
1868 Caithness, W., Corn Merchant, Arbroath
1853 Calder, Francis, Yetholm Mains, Kelso

Admitted
1857 Calder, James, Colgrain, Cardross
1846 Calder, Marcus, Shapinshay, Kirkwall
1857 Calder, Robert, Kelloe Mains, Edrom
1858 Calder, R., Whitehouse, Lumphanan
1851 Calder, W., Cattle-Salesman, Edinburgh
1841 Caldwell, Frederick, of Missnish
1862 Caldwell, Wm., Boydstone, Ardrossan
1843 Callender, Henry, C.A., Edinburgh
1854 Cameron, Alex., Strone, Fort-William
1857 Cameron, Alex., Bogside, Glasgow
1865 Cameron, Alex., of Mainhouse, Elgin
1865 Cameron, Rev. Allan Gordon, of Barcaldine, Bonaw
1859 Cameron, Donald, of Lochiel, M.P., Fort-William
1861 Cameron, D. Colin, Tallisker, Broadford
1835 Cameron, Hugh Innes, Dingwall
1857 Cameron, James, Balnakyle, Munlochy
1850 Cameron, P., 25 George Square, Edin.
1862 Cameron, William, Edinburgh
1837 Campbell, Alex., of Auchindarroch, Lochgilphead
1835 Campbell, A., 6 Charlotte Square, Edin.
1857 Campbell, A., Crosshill, Bishopbriggs
1868 Campbell, Alex., Blairton, Belhelvie
1863 Campbell, A. H., of Little Grove, Herts
1826 Campbell, Archibald, of Glendaruel
1857 Campbell, Lt.-Col. Archd., of Blythswood, Renfrew
1865 Campbell, Archd., late Park, Aberdeen
1868 Campbell, A., Dunmore Park, Stirling
1865 Campbell, Lt.-Col. A. H., Retired List, Bengal Army
1865 Campbell, Lt.-Col., of South Hall, Greenock
1816 Campbell, A., of Catrine, W.S., Edin.
1854 Campbell, A., yr. of Catrine, W.S., Edinburgh
1865 Campbell, Major-General, late of Kinloch, Dunkeld
1864 Campbell, C. Macpherson, of Ballimore, Tighnabruaich
1853 Campbell, Chas. V. H., of Nether Place, Cairnhill, Kilmarnock
1847 Campbell, C., of Colgrain, Dumbarton
1838 Campbell, C. G., of Stonefield, Tarbert
1858 Campbell, Colin Yorke, of Barbreck, Captain R.N.
1868 Campbell, Captain D. P., of Balliveolen, Bonaw
1854 Campbell, D., Kirkforthar, Markinch
1846 Campbell, Donald, Pennygael House, Tobermory
1857 Campbell, Donald, Ulva, Aros
1847 Campbell, Dugald M'Neill, of Kintarbet, Tarbert
1858 Campbell, D. T., Duiletter, Dalmally
1839 Campbell, Farquhar, of Aros, Tobermory
1863 Campbell, Geo. Wm., Mayfair, London
1835 Campbell, George J., of Treesbank, Kilmarnock
1867 Campbell, H. A., of Auchnacloich, Oban

Admitted
1823 Campbell, H. F., of Boquhan, Kippen
1861 Campbell, Hugh, Surgeon, Glenralloch, Tarbert
1838 Campbell, James, London
1847 Campbell, J., of Tillichewan, Dumbarton
1833 Campbell, James Archd., of Inverawe
1849 Campbell, James A., yr. of Stracathro, Glasgow
1860 Campbell, James G., Killyleoch, Dunscore, Dumfries
1848 Campbell, J., of Possil
1846 Campbell, J. L., of Achalader, Blairgowrie
1857 Campbell, John, Remnil, Campbeltown
1857 Campbell, John, of Inverardoch, Doune
1857 Campbell, John, of Ardfinaig, Ross of Mull, Aros
1865 Campbell, John D., of Peaton, Clachan, Roseneath
1863 Campbell, John Graham, of Shirvan, Lochgilphead
1843 Campbell, K., of Ardow, Tobermory
1857 Campbell, Lieut.-General, C.B., United Service Club, Edinburgh
1863 Campbell, Neil Colquhoun, of Barnhill, Dumbarton
1838 Campbell, Ord Graham, Edinburgh
1836 Campbell, R. D., of Jura, Lochgilphead
1802 Campbell, R., of Sonachan, Inverary
1861 Campbell, R. F. F., of Craigie, Ayr
1858 Campbell, Silvester, Kinnellar, Blackburn, Aberdeen
1860 Campbell, Thos., Croftness, Aberfeldy
1864 Campbell, T. H., of Millfield, Polmont
1856 Campbell, T. W., of Walton Park, Dalbeattie
1836 Campbell, Col. W., N.B. Staff, Glasgow
1839 Campbell, W., of Ormsary, Ardrishaig
1858 Campbell, Wm., Solicitor, Hamilton
1861 Campbell, W., Cladville, Islay
1863 Cant, James, Orr Bridge, Kirkcaldy
1852 Cantlie, Wm., Keithmore, Dufftown
1850 Carfrae, T., Land-Surveyor, Edinburgh
1845 Carlyle, T. J., of Waterback, Ecclefechan
1869 Carmichael, J., Bank Agent, Hawick
1825 Carmichael, M. T., of Eastend, Lanark
1847 Carnegie, D., of Stronvar, Lochearnhead
1854 Carnegie, G. R., Edrom-Newton, Ayton
1869 Carnegie, Henry L., of Kimblethmont, Arbroath
1852 Carnegie, James, of Edrom-Newton, W.S., Edinburgh
1836 Carnegie, John, of Redhall, Fordoun
1858 Carnegie, William, of Eastertown, Dunlappie, Brechin
1858 Carnegie, W., junior, Coul, Tannadyce
1850 Carnegy, John, Glasgow
1864 Carnie, C., of Blairhoyle, Thornhill, Stirling
1861 Carphin, George, Banker, Dunkeld
1869 Carphin, Jas. Rhind, C.A., Edinburgh
1863 Carre, W. R., of Cavers Carre, Selkirk

Admitted
1826 Carruthers, D. A., Warmanbie, Annan
1860 Carruthers, J., of Craig, New Galloway
1854 Carruthers, John, Kirkhill, Moffat
1848 Carruthers, Wm. Francis, of Dormont, Lockerbie
1838 Carstairs, Drysdale, Merchant, Liverpool
1869 Carsewell, David, Straiton, Leuchars
1863 Carter, Thos., Yew Tree Cottage, Grange, Edinburgh
1864 Carter, Walter, Bank Agent, Ayton
1868 Cartwright, T. R. B. Leslie-Melville, Melville House, Ladybank
1861 Carver, John, Kinloch, Meigle
1819 Cathcart, Elias, of Auchindrane, Ayr
1857 Cathcart, R., of Pitcarlie, Auchtermuchty
1866 Cattanach, A., of Auchintorlie, Paisley
1868 Chalmers, Alex. H., 13 Union Terrace, Aberdeen
1824 Chalmers, C., of Monkshill, Aberdeen
1860 Chalmers, Thos., of Longcroft House, Linlithgow
1864 Chambers, William, Soutarton, Forgue
1841 Chambers, Robert, St Andrews
1864 Chambers, Robert, jun., 10 Royal Crescent, Edinburgh
1849 Chancellor, J. G., of Shieldhill, Biggar
1857 Chandler, Henry, Salford
1867 Charlton, Matthew, jun., Browndeanlaws, Jedburgh
1860 Cheape, Lieut.-Col. Charles, of Killundine, Morven
1864 Cheape, G. C., of Strathtyrum, Wellfield, Strathmiglo
1857 Cheyne, Mrs, of Lismore, Oban
1838 Chiene, George Tod, C.A., Edinburgh
1860 Chirnside, G., Newton House, Chathill
1865 Chisholm, Duncan, Popachy, Inverness
1865 Chisholm, The, Erchless Castle, Inverness
1854 Chisholm, John, Charleston, Inverness
1831 Chisholm, Lachlan, late of Lochans
1856 Chisholm, Wm., Barnyards, Inverness
1840 Chivas, Alexander, Banker, Aberdeen
1850 Christie, Andrew, Adinston, Tranent
1850 Christie, Charles J., Westbank, Tranent
1862 Christie, C. J., 46 Quality Street, Leith
1841 Christie, C. Maitland, of Durie, Leven
1864 Christie, George, Shore, Stirling
1865 Christie, James, Blandfield, Edinburgh
1835 Christie, Captain James, Hillend, Clackmannan
1863 Christie, J. H. R. S., of Teasses, Largo
1846 Christie, John, late Goldielea, Dumfries
1861 Christie, P., Mains of Scotscraig, Tayport
1824 Christie, Robt., Accountant, Edinburgh
1857 Christie, T. R., of Bedlay, Moodiesburn
1848 Christison, R., M.D., Professor of Materia Medica, University of Edin.
1834 Chrystie, Captain A., late H.E.I.C.S.

Admitted
1855 Church, D. M., Ferniebank, Liberton
1838 Church, J., Tower of Sark, Canonbie
1860 Church, Miss Margaret, Park House, Canonbie
1859 Clapperton, Jas., Caddenlea, Galashiels
1855 Clapperton, John, Newlands, Gifford
1864 Clapperton, J., Home Lodge, Edinburgh
1853 Clark, Arch., Inverchapple, Kilmun
1838 Clark, Francis Wm., of Ulva, Aros
1842 Clark, James, Wormiston, Crail
1857 Clark, James, of Crossbasket, Glasgow
1864 Clark, James, Oldhamstock Mains, Cockburnspath
1851 Clark, John, Balyeoman, Dunfermline
1857 Clark, John, Flender, Busby
1858 Clark, John Gilchrist, of Speddoch, Dabton, Thornhill
1869 Clark, John, of Tillyprony, Tarland
1867 Clark, Lachlan, Tangy, Campbeltown
1862 Clark, M., of Little Culmain, Crocketford
1852 Clark, Samuel, Manswrae, Kilbarchan
1857 Clark, Wm., Lawhill, West Kilbride
1847 Clarke, Alexander, Eriboll, Lairg
1865 Clarke, Alexander M., Meddat, Parkhill
1865 Clarke, Aug. T., of Achareidh, Nairn
1855 Clarke, George, Stronchrubie, Assynt
1854 Clay, John, Kerchesters, Kelso
1838 Clayhills, Alex., of Invergowrie, Dundee
1860 Clerk, Duncan, Writer, Oban
1857 Climie, William, Paisley
1850 Clouston, Peter, Glasgow
1852 Coats, Peter, of Woodside, Paisley
1852 Coats, Thomas, of Ferguslie, Paisley
1843 Cobb, Wm., Mains of Fintray, Dundee
1861 Cochraue, Alex., of Ashkirk, Hawick
1842 Cochrane, Alex. Baillie, of Lamington
1854 Cochrane, Henry, 7 St Andrew Sq., Edin.
1849 Cochrane, Jas., of Harburn, West Calder
1858 Cochrane, Jas., Little Haddo, Foveran
1861 Cockburn, George, Kilchiaron, Islay
1866 Cockburn, Arch. D., 6 Athole Cresent, Edinburgh
1867 Cockburn, William, V.S., Glasgow
1830 Cogan, Robert, Merchant, Glasgow
1848 Cole, Captain William W., London
1850 Colledge, Wm., Haggs Castle, Pollockshaws
1868 Collie, Alex. W., Lairshill, New Machar, Aberdeen
1853 Collie, John, Elgin
1843 Collier, John, Panlathie, Carnoustie
1857 Collyer, Wm. D., of Cormiston, Biggar
1854 Colquhoun, A. Campbell, yr. of Killermont, Maryhill
1850 Colquhoun, J., Corkerhill, Pollockshaws
1824 Colquhoun, John Campbell, of Killermont, Maryhill
1860 Colvin, Wm., of Craigielands, Moffat
1839 Condie, Jas., Blackfriar's House, Perth
1865 Congreve, John, of Flichity, Inverness
1843 Connell, Jas., of Conheath, Irvine House, Langholm

Admitted
1852 Conning, John, Solicitor, Perth
1852 Constable, G., of Soylziary, Blairgowrie
1854 Constable, James C., of Callie, Blairgowrie
1860 Constable, James, Seaside, Errol
1864 Constable, Rev. John, Principal of the Royal Agricultural College, Cirencester
1841 Cook, John, W.S., Edinburgh
1865 Cooper, Alexander, Writer, Elgin
1845 Cooper, H. R., of Ballindalloch, Balfron
1858 Cooper, Jas., Chapelton, Methlic, Ellon
1845 Cooper, Wm., of Failford, Tarbolton
1855 Copland, R., Mill of Ardlethen, Ellon
1864 Copland, Jn., Mainshead, Maxwelltown
1863 Copland, Walter, Thirlstane, Selkirk
1840 Cordiner, W. F., Mormond House, Cortes
1860 Corrie, Adam, South Park, Borgue, Kirkcudbright
1859 Cossar, Robert, Chesterhall, Dunbar
1864 Cotesworth, Robert, of Cowdenknowes, Melrose
1857 Coubrough, A., Biggarshields, Biggar
1852 Coubrough, J., Blairtummock, Campsie
1869 Coulter, Thomas, Merchant, Lochgilphead
1859 Coupar, John, Balrownie, Brechin
1865 Cousin, George, Sunnyside, Edinburgh
1864 Cousland, James, Banker, Denny
1858 Coutts, William, Sandlaw, Banff
1844 Coventry, Andw., of Pitilloch, Edin.
1852 Coventry, Geo. Andw., yr. of Shanwell
1864 Coventry, Wm., Pleasance, Aberdour
1857 Cowan, Andrew, Spittalhill, Fintry
1836 Cowan, C., of Logan House, Penicuik
1860 Cowan, Charles W., yr of Logan House, Penicuik
1858 Cowan, Jn., of Beeslack, Milton Bridge
1857 Cowan, Peter, Lurg, Fintry
1854 Cowan, Richard, late Merchant, Leith
1861 Cowan, Robert, W.S., Edinburgh
1862 Cowan, Robert, Park Mains, Paisley
1868 Cowie, Alexander, Badenscoth, Turriff
1853 Cowie, Alexander, Crombly Bank, Ellon
1851 Cowie, David, Dysart, Montrose
1852 Cowie, Jas., Sundredge Hall, Bromley, Kent
1869 Cowper, John Cardno, of Craigiebuckler, Aberdeen
1858 Craib, John, Strathmore, Tarland
1855 Craig, David, Papermaker, Portobello
1850 Craig, James, 33 Manor Place, Edin.
1857 Craig, J., of Craigdarroch, New Cumnock
1863 Craig, Jas. H. Gibson, yr. of Riccarton, Hermiston
1857 Craig, John, Guelt, Old Cumnock
1867 Craig, John, Jellyhill, Bishopbriggs
1857 Craig, John, Littlehill, Bishopbriggs
1860 Craig, Josh., of Threecrofts, Lochrutton
1867 Craig, Robert, Auchentiber, Greenock
1857 Craig, Robert, Buckley, Bishopbriggs
1868 Craig, R. Drumbuie, Glen Urquhart
1859 Craig, William, Writer, Dumfries

Admitted
1855 Craig, William C., Anneston, Biggar
1862 Craig, W., Craig Villa, New Cumnock
1858 Craigie, Wm. Roper, Toman Droighne, Ballinluig
1868 Craik, J., jun., West Carsebank, Forfar
1863 Craike, Charles, Esbie, Lochmaben
1857 Cranston, J., Pathhead, Cockburnspath
1849 Cranstoun, George Cranstoun Trotter, of Dewar, Ayton
1859 Cranstoun, William S., Dyke, Moffat
1809 Craufurd, W. Houison, of Craufurdland, Kilmarnock
1850 Crawford, Adam, Royal Terrace, Edin.
1853 Crawford, Alexander, Writer, Dunse
1822 Crawford, Charles, late East Fortune
1860 Crawford, D., Barnbeath, Kilbarchan
1855 Crawford, James Coutts, of Overton, Strathaven
1854 Crawford, John, The House of Tongue, Lairg
1865 Crawford, John, Millstoneford, West Kilbride
1857 Crawford, P., Dumjoyack, Strathblane
1836 Crawford, Wm., late of Doonside, Ayr
1860 Crawford, William, Balgarvie, Perth
1867 Crawford, Muir, Leith
1866 Crawford, R., Balbougie, Inverkeithing
1838 Crawfurd, W. S. Stirling, of Milton, Glasgow
1866 Crease, Wm., 6 George Square, Edin.
1861 Crerar, J., Easter Drumatherty, Dunkeld
1850 Creyk, Dr A., Pitchaish, Ballindalloch
1838 Crichton, Hew, S.S.C., Edinburgh
1849 Crichton, Hew Hamilton, W.S., Edin.
1847 Crichton, Jas. Arthur, Advocate, Edin.
1849 Crichton, John, of Linn, Dalry, Ayr
1859 Crichton, William, Live Stock Agent, Haddington
1849 Croall, John, Middlefield House, Edin.
1835 Crombie, A., of Thornton, Laurencekirk
1858 Crombie, Alex., yr. of Thornton, W.S., Edinburgh
1861 Crombie, John, 90 Lauriston Pl., Edin.
1857 Cromarty, Wm., St Margaret's Hope, Orkney
1845 Cross, David, Seed Merchant, Glasgow
1865 Crossman, M. G., Corn Merchant, Berwick
1858 Cruickshank, Amos, Sittyton, Aberdeen
1868 Cruickshank, Andw., Conland, Huntly
1847 Cruickshank, Anthony, Aberdeen
1868 Cruickshank, Edw., Lethenty, Inverurie
1852 Cruickshank, George, Comisty, Huntly
1852 Cruickshank, John, Elgin
1865 Cruickshank, William, Milton of Brachlick, Ardersier
1865 Crum, Alex., Capelrig, Newton Mearns
1868 Cumming, George, Writer, Banff
1865 Cumming, Henry Gordon, Pittyvaich, Dufftown
1857 Cumming, Robt. Crawford, of Barremman, Roseneath

Admitted
1850 Cuninghame, D., Chapelton, Ardrossan
1857 Cunliff, Richard Stedman, Glasgow
1841 Cunningham, A., of Balgownie, Culross
1841 Cunningham, Alex., Morebattle Tofts, Kelso
1854 Cunningham, A. G., Rosebank, Currie
1863 Cunningham, C. R., Grahamslaw, Kelso
1864 Cunningham, J., Tarbreoch, Dalbeattie
1866 Cunningham, J. Barry, of Hensol, Castle-Douglas
1864 Cunningham, J. C., West Bow, Edin.
1867 Cuninghame, John of Balgownie, Stirlingshire
1852 Cunningham, John Sinclair, West Bow, Edinburgh
1867 Cunningham, John, Trees, Maybole
1857 Cunningham, J., Whitecairn, Dalbeattie
1864 Cunningham, Jn. M., Solicitor, Stirling
1851 Cunningham, T., Dallachy, Aberdour
1857 Cunningham, Thos., Kirkettle, Roslin
1836 Cunningham, W. A., of Logan, Cumnock
1857 Cunningham, Wm., Hole, Lennoxtown
1859 Cunningham, W. C. S., of Caprington, Kilmarnock
1867 Cunnyngham, Robt. Dick, yr. of Prestonfield, Edinburgh
1859 Currie, Andrew, of Glassmount, Kinghorn, Fife
1853 Currie, James, Halkerston, Gorebridge
1863 Currie, William, of Linthill, Lilliesleaf
1849 Curror, Adam, Myreside, Edinburgh
1867 Curror, David, of Wester Craigduckie, Edinburgh
1848 Curror, John, Comiston, Lothian Burn
1859 Curror, Robert, Stirling
1822 Cuthbertson, A., Greendykes, Tranent
1836 Cuthbertson, Wm., Merchant, Glasgow

1853†Dalkeith, Right Hon. the Earl of
1831†Dalhousie, Right Hon. the Earl of, K.T.
1862 Dunmore, Right Hon. the Earl of
1843 Dudley, Right Hon. the Earl of
1860 Dunglass, Right Hon. Lord
1861 Drummond, Hon. Francis
1865 Dalrymple, Hon. G. Grey, St Boswells
1866 Duff, Hon. George Skene
1838 Deas, Hon. Lord
1845 Dunbar, Sir Wm., of Moehrum, Bart.
1841 Dalrymple, Sir H., of N. Berwick, Bart.
1866 Dalyell, Sir R. A. O., of Binns, Bart.
1839 Dunbar, Sir Archibald, of Northfield, Bart.
1839 Dunbar, Sir G., of Hempriggs, Bart.
1851 Douglas, Sir G. H. S., of Springwood Park, Bart.
1828 Dundas, Sir David, of Dunira, Bart.
1848 Davie, Sir Henry R. Ferguson, of Creedy, Bart., M.P.
1851 Dale, John R., Auldhame, N. Berwick
1841 Dalgairns, Lieut.-Col., Balgersho, Coupar-Angus

Admitted
1857 Dalgleish, Jas. Ogilvie, of Woodburne, Ceres
1857 Dalgleish, J., of Ardnamurchan, Edin.
1857 Dalgleish, John J., yr. of Ardnamurchan, Edinburgh
1858 Dalgleish, L., Camersinas, Strontian
1848 Dalgleish, R. Bayne, of Dura, Cupar-Fife
1857 Dalglish, Robt., of Kilmardinny, M.P., Glasgow
1862 Dalmahoy, Patrick, of Bowerhouse, W.S., Edinburgh
1862 Dalrymple, Charles, of Hailes, M.P., Musselburgh
1868 Dalrymple, C. Elphinstone, of Kinellar Lodge, Aberdeen
1857 Dalrymple, James, of Woodhead, Kirkintilloch
1859 Dalrymple, Jas., of Langlee, Galashiels
1857 Dalzell, Allen, M.D., Edinburgh
1835 Dalzell, James Allen, North Berwick
1860 Dalziel, Alex., The Knowe, Sanquhar
1860 Dalziel, George, Merkland, Thornhill
1869 Dalziel, J., Tinwaldshaws, Dumfries
1857 Darling, Adam, Berwick
1863 Darling, J. S., of Lednathie, W.S., Edinburgh
1863 Darling, T., Mordington Mains, Berwick
1839 Darling, Wm., Prestlaw, Haddington
1865 Darroch, D., of Gourock, Greenock
1855 Davidson, Adam, Nairn
1855 Davidson, Alex., Mains of Cairnbogie, Old Meldrum
1824 Davidson, Dun., of Tulloch, Dingwall
1864 Davidson, Duncan H. C. R., yr. of Tulloch, Inverbroom, Dingwall
1847 Davidson, George, Dean Park, Balerno
1860 Davidson, George, Walton, Linlithgow
1848 Davidson, H., of Muirhouse, Edinburgh
1841 Davidson, Henry M., Sheriff-Clerk of Haddingtonshire
1839 Davidson, Hugh, Old Hall, Wattin
1864 Davidson, J., Land Steward, Craithes, Aberdeen
1834 Davidson, P., of Inchmarlo, Aberdeen
1865 Davidson, Robert, Banker, Inverness
1850 Davidson, Wm. J., of Ruchill, Glasgow
1866 Davidson, W. G., of South Fod, Dunfermline
1859 Dawson, John, Swinton Bridge End, Coldstream
1864 Dawson, Wm., Warriston, Hermiston
1856 Dean, John, Mains of Balquhain, Keith Hall
1850 Deans, Henry, East Fenton, Drem
1857 Deans, J. Y., of Kirkstyle, Kilmarnock
1850 Deans, Peter D., Portobello
1823 Dempster, George, late of Skibo
1857 Dempster, G. H., of Dunnichen, Forfar
1854 Denholm, Alexander, Baitlaws, Biggar
1854 Denholm, D., Carberry, Musselburgh
1867 Denholm, D., jun., Cauldcoats, Liberton

Admitted
1850 Dennistoun, Alexander H., Glasgow
1838 Dennistoun, John, Helensburgh
1839 Denoon, David, Merchant, London
1832 Dewar, Lieut.-Col. Alex. C., Vogrie
1864 Dewar, A., Arnprior, Kippen, Stirling
1860 Dewar, Gilbert Innes, Edinburgh
1842 Dewar, James, of Vogrie, Ford
1861 Dewar, John, Wine Merchant, Perth
1864 Dewar, Peter, King's Park, Stirling
1864 Dewhurst, G. C., of Aberuchill, Comrie
1856 Dick, Dr John, Broombank, Mid-Calder
1864 Dick, J., of Craigengelt, Writer, Stirling
1828 Dick, Wm. D., of Montrave, Kennoway
1868 Dick, Wm., of Tullymet, Ballinluig
1859 Dickenson, William, Longcroft, Lauder
1857 Dickie, John, Seedsman, Kilmarnock
1869 Dickie, Joseph, Union Bank, Dunkeld
1867 Dickie, Robt., Killeonan, Campbeltown
1869 Dickinson, George T., of Wheelbirks, Newcastle-on-Tyne
1848 Dickson, Alex., Hermiston, Edinburgh
1854 Dickson, Archd., Bughtrig, Coldstream
1859 Dickson, James, Dyemill, Moffat
1850 Dickson, James J., C.A., Edinburgh
1858 Dickson, James A., Banker, Arbroath
1844 Dickson, J., Saughton Mains, Edinburgh
1862 Dickson, J. H., Saughton Mains, Edin.
1846 Dickson, John, W.S., Perth
1858 Dickson, John F., Panbride House, Carnoustie
1858 Dickson, Peter, London
1860 Dickson, T., of Crochmore, Durrisdeer
1849 Dingwall, Walter, Edinburgh
1851 Dingwall, W., Ramornie, Ladybank
1863 Dinning, John, Belford
1860 Dirom, Major Thos. Pasley, of Mount Annan, Annan
1849 Dixon, Thomas G., Rhyl
1862 Dobbie, David, Tinwald Parks, Dumfries
1866 Dobie, John, Campend, Dalkeith
1863 Dodd, Nicholas, Nisbet, Kelso
1863 Dodd, James, Mossburnford, Jedburgh
1837 Dodd, William, Merchant, Glasgow
1857 Doddrell, George J., Glasgow
1865 Dodds, James, Factor, Leslie House, Markinch
1844 Dodds, J., Cranston Riddell, Dalkeith
1850 Dods, W., Seed Merchant, Haddington
1863 Dods, William, Elwartlaw, Greenlaw
1858 Don, Alexander, Keirsbeath, Crossgates
1858 Donald, James, Waulkmill, Midmar
1865 Donald, Jas., Pitalpine Works, Lochee, Dundee
1845 Donaldson, James, of Keppoch, Cardross
1868 Donaldson, R. S., East Newton, Arbroath
1844 Dougal, John, of Ratho, Edinburgh
1865 Dougall, Adam, Stewarton, Kirkinner
1865 Dougall, Andrew, Railway Manager, Inverness
1857 Dougall, Capt. Maitland, of Scotcraig, Tayport

Admitted
1868 Douglas, Archibald C., of Mains, East Kilpatrick
1858 Douglas, Bentlem, Cairntows, Liberton
1839 Douglas, F. B., Advocate, Edinburgh
1867 Douglas, George Sholto, Riddletonhill, St Boswells
1863 Douglas, James, of Cavers, Hawick
1866 Douglas, E. O., of Killiechassie, Aberfeldy
1868 Douglas, Arthur J., of Lockerbie
1864 Douglas, Ronald, Conon, Dingwall
1861 Douglas, Thomas, Clyth, Lybster
1854 Douglass, Alex. Forbes, Haddo House, Aberdeen
1851 Donie, Andrew, Blair-Adam
1864 Donie, John R. S., Factor, Polmaise, Stirling
1853 Dove, J., Eccles Newtown, Coldstream
1858 Dowell, A., 32 Royal Circus, Edinburgh
1838 Downie, John, Merchant, Glasgow
1867 Downie, William, Mains of Linton, Cluny, Aberdeen
1857 Drennan, James, Holmston, Ayr
1850 Drew, Laurence, Merryton, Hamilton
1857 Drife, James, New Zealand
1843 Drimmie, Daniel, Panmure Bleachfield, Dundee
1861 Dron, William, Crieffvechter, Crieff
1835 Drummond, G. H., of Blair-Drummond
1859 Drummond, Henry, Seedsman, Stirling
1864 Drummond, John, of Balquhandy, Guilton Rectory, Wingham, Kent
1852 Drummond, J. M., of Megginch, Errol
1828 Drummond, Thos., of Craigie, Dundee
1858 Drybrough, Thos., Brewer, Edinburgh
1863 Dryden, W., Land-Steward, Springwood Park, Kelso
1858 Drysdale, Andrew, Alloa
1868 Drysdale, David, Pleasants, Dunbar
1864 Drysdale, Henry, Mains of Aberdalgie, Perth
1861 Drysdale, Wm., yr. of Kilrie, Kinghorn
1868 Duckering, R. E., Northorpe, Kirton Lindsey
1850 Dudgeon, James, late Fodderty, Dingwall
1840 Dudgeon, John, of Pearcelands, Sussex
1862 Dudgeon, J. S., The Rocks, West Hoathly, Sussex
1847 Dudgeon, John, Almondhill, Kirkliston
1856 Dudgeon, John B., Crakaig, Golspie
1851 Dudgeon, Patrick, of Cargen, Dumfries
1849 Dudgeon, Robt., Humbie, Winchburgh
1839 Duff, Rev. David, D.D., Minister of Kenmore
1868 Duff, Major James, Knochleith, Turriff
1865 Duff, J., Melgund, Aberlemno, Forfar
1858 Duff, Lauchlan Duff G., of Drummuir
1861 Duff, T., 1 Geo. IV. Bridge, Edinburgh
1866 Duff, Robert W., of Fetteresso, M.P., Stonehaven
1864 Duff, A. T. W., of Orton, Fochabers

Admitted
1858 Duguid, P., of Cammachmore, Aberdeen
1863 Dun, John, of Gilston, Galashiels
1851 Duncan, Alexander, of Providence, Rhode Island
1857 Duncan, A., Leuchars Castle, Leuchars
1864 Duncan, Alex., of Glencarron, Denny
1858 Duncan, D. H., Friock Mains, Arbroath
1867 Duncan, D. S., Monkton, Musselburgh
1843 Duncan, George, The Vine, Dundee
1868 Duncan, James, Aulich, Pitlochrie
1855 Duncan, John, Newseat of Tolquhon, Tarves
1858 Duncan, John, Ardo, Methlic
1855 Duncan, Robert, Kirkmay, Crail
1868 Duncan, R., Auchenbaidie Mains, Banff
1848 Duncan, William, S.S.C., Edinburgh
1868 Duncan, W. J., National Bank, Edin.
1862 Dundas, Col. J., of Carron Hall, Falkirk
1847 Dundas, Robt., of Arniston, Gorebridge
1828 Dunlop, A. C. S. M., of Corsock, Edin.
1857 Dunlop, Alexander, Glasgow
1849 Dunlop, George, Hill Street, Edinburgh
1844 Dunlop, James, of Doonside, Largs
1844 Dunlop, James, of Arthurlee, Barrhead
1836 Dunlop, John, late Duddingston, Edin.
1859 Dunlop, J., late Clermiston, Corstorphine
1853 Dunlop, William H., of Annanhill, Kilmarnock
1854 Dunn, Adam, Tranent Mains, Tranent
1858 Dunn, A., Wester Leochel, Craigievar
1863 Dunn, David, Berryhill, Kelso
1858 Dunn, J., Wester Innenteer, Craigievar
1853 Dunn, Wm., Roxburgh Mains, Kelso
1858 Durie, David, Nether Mill, Fettercairn
1855 Durie, Robert Hogg, Barney Mains, Haddington
1868 Durno, John, Lambhill, Forgue, Insch
1847 Duthie, A., of Ruthrieston, Edinburgh
1868 Duthie, William, Banker, Tarves
1832 Dyson, Thomas C., of Willowfield, Halifax, Yorkshire

1854 Errol, Right Hon. The Earl of
1863 Eglinton and Winton, Right Hon. The Earl of
1847 Elcho, Right Hon. Lord, M.P.
1836 Elibank, Right Hon. Lord
1860 Elphinstone, Right Hon. Lord
1867 Elphinstone, Hon. Edward Buller
1868 Elphinstone, Hon. George James, Innerhaddon, Pitlochrie
1821 Edmonstone, Sir Archibald, of Duntreath, Bart.
1840 Elphinstone, Sir James Dalrymple Horn, of Horn and Logie-Elphinstone, Bart., M.P.
1860 Erskine, Sir T. of Cambo, Bart., Crail
1861 Elliot, Sir Walter, of Wolfelee, K.C.S.I., Hawick
1860 Easson, Robert, Errol Cottage, Errol
1865 Eden, Right Rev. Bishop, Hedgefield House, Inverness

Admitted
1857 Edgely, Thomas, Gilmerton, Edinburgh
1864 Edington, Peter, Land Steward, Drummond Castle
1863 Edmiston, Hugh Fleming, Yoker Mains, Glasgow
1857 Edmond, John, Croftamie, Drymen
1869 Edmond, David, of Ballochruin, Balfron
1858 Edmonds, Leonard, London
1869 Edmonston, D., Baltasound, Unst
1868 Edmonston, Thos., of Buness, Lerwick
1843 Edward, Allan, Merchant, Dundee
1859 Edwards, Matthew, Hilton, Alloa
1865 Edwards, Dr J., Beechfield, Grantown
1863 Elder, George, of Knock Castle, Wemyss Bay
1854 Elder, James, late, Whitehill Mains, Liberton
1866 Elder, J., East Bearford, Haddington
1854 Elder, Thomas, Amisfield Mains, Haddington
1836 Ellice, Edward, of Glenquoich, M.P.
1852 Elliot, A., M.D., Goldielands, Hawick
1863 Elliot, H., junior, Greenriver, Hawick
1853 Elliot, James, Galalaw, Kelso
1854 Elliot, John, Primrosehill, Dunse
1863 Elliot, John, of Binks, Burnmouth, Newcastleton
1863 Elliot, John, The Flatt, Newcastleton
1848 Elliot, Robert, Laighwood, Dunkeld
1849 Elliot, Robert Kerr, of Clifton, Kelso
1852 Elliot, Thomas, Hindhope, Jedburgh
1854 Elliot, Thomas, Blackhall, Galashiels
1860 Elliot, Walter, Hollybush, Galashiels
1867 Elliot, Thomas, Knockdon, Maybole
1866 Elliot, Walt., Hermitage, Newcastleton
1827 Elphinstone, Lieutenant-Colonel John
1854 Embleton, John, Broomhouse, Berwick-on-Tweed
1841 Errington, Rowland, of Sandhoe, Northumberland
1862 Erskine, H. David, of Cardross, Stirling
1859 Erskine, Vice-Admiral John E., M.P., London
1849 Erskine, James, of Shielfield, Melrose
1843 Erskine, Thomas, of Linlathen, Broughty Ferry
1868 Erskine, W. H. Kennedy of Dun, Montrose
1857 Euing, William, Glasgow
1858 Ewen, Robert, Westown, Tarland
1844 Ewing, Alexander, Glasgow
1857 Ewing, Alex. Crum, yr. of Strathleven, Polmont Bank, Falkirk
1851 Ewing, Arch. Orr, of Ballikinrain, M.P., Killearn
1857 Ewing, Humphrey Ewing Crum, of Strathleven, M.P.
1844 Ewing, James L., Glasgow
1838 Ewing, John Orr, Glasgow

1840† Fife, Right Hon. the Earl of, K.T.
1864 Forbes, Hon. Charles M. H., of Brux

Admitted
1865 Fraser, Col. the Hon. Allister E., Elean Agis
1857 Forbes, Sir W., of Craigievar, Bart.
1854 Fergusson, Sir J., of Kilkerran, Bart.
1828 Forbes, Sir Charles, of Newe and Edinglassie, Bart.
1868 Fair, F., of Monte Grande, Buenos Ayres
1854 Fair, J. S. Elliot, of Langlee, Jedburgh
1863 Fair, John S. Elliot, Wells, Jedburgh
1864 Fairholme, Geo. K. Erskine, of Old Melrose, Melrose
1837 Fairlie, James Ogilvie, of Coodham, Kilmarnock
1865 Fairlie, James, Tanfield, Edinburgh
1831 Fairrie, John, Merchant, London
1835 Falconar, George, Craig Kennochy, Burntisland
1858 Falconer, Don., Connonsyth, Arbroath
1851 Falconer, Peter, Disblair, Summerhill, Aberdeen
1865 Falconer, Thomas, Kinermony, Craigellachie
1849 Falshaw, James, 26 Castle Street, Edin.
1850 Fairie, James, of Farme, Glasgow
1860 Farish, Samuel, Kirklands, Lockerbie
1852 Farquhar, Arthur, of Elsick, W.S., Stonehaven
1850 Farquharson, F., of Finzean, Edinburgh
1865 Farquharson, James Ross, of Invercauld, Braemar
1865 Farquharson, J., New Market, Aberdeen
1843 Farquharson, Major-General Francis
1856 Farquharson, F., Builder, Haddington
1852 Farquharson, James, Auchinblae
1841 Farquharson, Major John, of Corrachrie, Tarland
1857 Farquharson, Robert O., of Haughton, Alford
1858 Farrell, Alfred Herbert William, Davo House, Fordoun
1857 Farrell, M., of Woodburnden, Fordoun
1863 Fender, Robert, Rules Mains, Dunse
1843 Fenton, John, Mill of Mains, Dundee
1862 Fenwick, John, North House, Hawick
1852 Ferguson, J. D., Richmond, Yorkshire
1824 Ferguson, John, of Knockindale
1863 Ferguson, John, Burghlee, Loanhead
1855 Ferguson, John, East Grange, Forres
1860 Ferguson, John, Brae of Coynach, Mintlaw
1846 Ferguson, J., of Kilquhanity, Dalbeattie
1858 Ferguson, Thomas, Kinnochtry, Coupar-Angus
1868 Ferguson, Thomas, Auldtown of Coynoch, Mintlaw
1864 Ferguson, Wm., 22 James Square, Edin.
1836 Ferguson, Samuel R., of Middlehaugh, London
1869 Ferme, George, Black Hall, Kincardine-on-Forth
1853 Fernie, John Carmichael, late Balfarg, Markinch

Admitted
1850 Fettes, James, Surgeon, Laurencekirk
1864 Field, Rev. Edward Burch, of Morcland, Edinburgh
1864 Field, James Hamilton, yr. of Moreland, Edinburgh
1869 Field, Sydney, Aberdeen
1857 Findlay, Colonel, of Baturrich, Dumbarton
1855 Findlay, Robert, Springhill, Bailieston, Glasgow
1847 Findlay, T. Dunlop, Easterhill, Glasgow
1857 Findlay, W., Brackenbrae, Bishopbriggs
1844 Finlay, A. S., of Castle Toward, Dunoon
1859 Finlay, John, New Farm, Lochgelly
1859 Finlayson, John, Factor, Lochalsh
1864 Finlayson, W., Harperstone, Dunblane
1865 Finnie, Arch., Springhill, Kilmarnock
1861 Fisher, Donald, Pitlochrie
1852 Fleming, A., Mains of Fullwood, Paisley
1867 Fleming, David, Avonmill, Hamilton
1857 Fleming, James, Coats, Penicuik
1857 Fleming, James, Holm, Stonehouse
1854 Fleming, James, Three-Mile-Town, Linlithgow
1864 Fleming, James, Carmuirs, Falkirk
1864 Fleming, J. N., of Knockdon, Glasgow
1857 Fleming, John, Ballindalloch
1857 Fleming, John, Hawkwood, Strathaven
1865 Fleming, J., 26 Queen's Gate, London
1826 Fletcher, Angus ,of Dunans, Edinburgh
1857 Fletcher, Archibald, Tyndrum
1848 Fletcher, Major C.E., late of Corsock
1857 Fletcher, Don., of Bernice, Altamore, Tighnabruaich
1865 Fletcher, J., of Rosehaugh, Munlochy
1857 Fletcher, J., yr. of Salton, Haddington
1861 Flockhart, J., Charleton, Colinsburgh
1861 Flockhart, W., Flockhouse, Blair-Adam
1865 Foggo, Robert Gordon, Rothiemurchus, Aviemore
1850 Forbes, Arthur, of Culloden, Inverness
1868 Forbes, Charles D., Haddo, Huntly
1836 Forbes, Charles Henry, of Kingairloch, Bonaw
1856 Forbes, Charles William, late Moniach Castle, Inverness
1830 Forbes, George, Merchant, London
1865 Forbes, Duncan, of Leanach, Culloden, Inverness
1835 Forbes, George, Kinnoull, Perth
1830 Forbes, James Stewart, Edinglassie, Strathdon
1862 Forbes, James Ochoncar, of Corse, Whitehouse
1842 Forbes, Major John, of Inverernan, C.B., Strathdon
1850 Forbes, John, of Haddo, Huntly
1834 Forbes, P., of St Catherine's, Edinburgh
1835 Forbes, Wm., of Medwyn, Edinburgh
1860 Forbes, William, of Callendar, Falkirk
1863 Forbes, William, Auchindinny, Milton Bridge

Admitted
1849 Ford, William, Hardengreen, Dalkeith
1868 Fordyce, James Dingwall, of Culsh, Advocate, Edinburgh
1868 Fordyce, William Dingwall, of Brucklay, M.P., Mintlaw
1838 Forlong, William, of Erins, Tarbert
1831 Forman, John Nairne, W.S., Edin.
1863 Forman, John, Duncra Hill, Tranent
1852 Forman, Robt., Keith House, Dalkeith
1857 Forrest, David, of Treesbanks, Shotts
1843 Forrest, James, jun., Kirriemuir
1867 Forrest, John Clark, Banker, Hamilton
1863 Forrest, Peter, Banker, Shotts
1863 Forrest, William, South America
1842 Forrester, John, W.S,, Edinburgh
1851 Forrester, Wm., 16 Northumberland St. Edinburgh
1865 Forsyth, David, Writer, Elgin
1863 Forsyth, Grorge, Ashybank, Hawick
1855 Forsyth, John, Bellview, Parkhill, Tain
1857 Fortune, George, Barnsmuir, Crail
1854 Fortune, William R., of Muircambus, Colinsburgh
1861 Foulis, Robert, M.D., Cairnie Lodge, Cupar-Fife
1846 Fowler, Henry Mackenzie, of Raddery, Fortrose
1849 Fox, Michael, jun., late Glencorse Mains, Penicuik
1838 Fox, Richard M., of Foxhall, Rathowen, Ireland
1857 Foyer, David, Knowehead, Campsie
1867 France, Robert, Logie Cottage, Stirling
1857 Fraser, Alexander, Faillie, Inverness
1868 Fraser, Alex., (Neill & Co.), Edinburgh
1840 Fraser, Andrew, W.S., Sheriff-Substitute, Fort-William
1820 Fraser, A. T. F., of Abertarff, Inverness
1816 Fraser, Col. C., of Castle Fraser, Cluny
1840 Fraser, Evan Baillie, Inverness
1853 Fraser, Hugh, Balloch of Culloden, Inverness
1856 Fraser, Hugh, London
1840 Fraser, John, London
1856 Fraser, John, of Bunchrew, Inverness
1865 Fraser, Capt. John, of Balnain, Campville, Inverness
1854 Fraser, Patrick Allan, of Hospitalfield, Arbroath
1863 Fraser, Patrick, Sheriff of Renfrewshire
1839 Fraser, Robert, Brackla, Nairn
1867 Fraser, Simon, Craignish Castle, Lochgilphead
1817 Fraser, Vice-Admiral T., Portobello
1837 Fraser, William, W.S., Edinburgh
1850 Fraser, W. S., Banker, Dornoch
1852 Fraser, William, Kilmuir, Skye
1861 Fraser, William, Peel, Tibbermuir
1865 Fraser, Wm., Upper Lairg, Inverness
1858 Frazer, John, Overton, New Abbey, Dumfries
1857 Frederick, D., Dumbreddon, Stranraer

Admitted
1868 Freeland, James, Broadgate, Strathblane
1835 Freeland, Robt., of Gryffe Castle, Bridge of Weir
1855 French, James, Lampits, Carnwath
1858 Frew, James, Balmalloch, Kilsyth
1867 Frew, Thomas, Gavell House, Kilsyth
1854 Friar, Thomas, of Grinden Bridge, Etal
1844 Fullarton, G., of Kerelaw, Stevenston
1857 Fulton, Andrew, 86 George Street, Edinburgh
1863 Fulton, Wm., Hatchetnize, Coldstream
1847 Fyfe, John, of Dalmarnoch, Glasgow
1861 Fyfe, Robert, junior, Arlary, Kinross

1830†Galloway, Right Hon. The Earl of
1822†Glasgow, Right Hon. The Earl of
1860 Garlies, Right Hon. Viscount, M.P.
1868 Gordon, Hon. John Campbell
1865 Grant, Hon. J., M.P., of Grant, Forres
1860 Grierson, Sir Alex. Wm., of Rockhall, Bart.
1854 Grant, Sir Arch., of Monymusk, Bart.
1859 Grant, Sir G. Macpherson, of Ballindalloch, Bart.
1834 Gladstone, Sir Thos., of Fasque, Bart.
1862 Grant, Lieut.-Gen. Sir Patrick, G.C.B.
1864 Gair, Hugh A., Hilton, Inverness
1868 Gairdner, Chas., Union Bank, Glasgow
1858 Gairdner, Robert, Banker, Kilmarnock
1857 Galbraith, Alex., Croy Cunningham, Killearn
1864 Galloch, J., Knockhill, Bridge of Allan
1861 Galloway, David, Cairnie, Glencarse
1859 Gamgee, J., Albert Veterinary College, London
1859 Garden, Archibald, Grangegreen, Forres
1850 Garden, Wm., M.D., Balfluig, Aberdeen
1857 Garden, Wm., Braco Park, Fraserburgh
1857 Gardiner, George, Carrington Barns, Lasswade
1855 Gardiner, James, Lanton, Mid-Calder
1861 Gardiner, R., Lowbank, Auchterarder
1859 Gardner, James, 58 George Street, Edinburgh
1844 Gardner, John, late of Springbog
1864 Gardner, P., Rotearns, Braco, Perthshire
1855 Gardner, Robert, Leithen Bank, Innerleithen
1855 Gardner, Robert, City of Glasgow Bank, Whitburn
1867 Gardyne, Col. C. G., of Finhaven, Forfar
1849 Garland, John, Cairnton, Fordoun
1851 Garland, Thomas, Ardlethen, Ellon
1825 Gartshore, John Murray, of Gartshore, Kirkintilloch
1864 Gartshore, John, Seedsman, Falkirk
1854 Gatherer, George, Writer, Elgin
1859 Gaukroger, G., Southfield, Longniddry
1843 Geddes, James, Orbliston, Fochabers
1837 Geekie, Alex., of Baldowrie, Coupar-Angus
1837 Geekie, Peter, Balboughty, Perth

Admitted
1861 Geekie, Peter M., Cortachy, Kirriemuir
1843 Geekie, R., of Rosemount, Blairgowrie
1844 Geils, J. E., of Dumbuck, Dumbarton
1840 Gentle, Robert, Dell, Inverness
1842 Gerard, Archibald, of Rochsoles, Airdrie
1855 Gibb, David, Bridge of Dye, Banchory-Ternan
1834 Gibbon, A., of Johnston, 6 Newbattle Terrace, Edinburgh
1869 Gibbons, John, jun., Cattle Salesman, Liverpool
1849 Gibbs, B. T. Brandreth, London
1863 Gibson, James, The Shaws, Selkirk
1864 Gibson, J., Gunsgreen Hill, Eyemouth
1825 Gibson, John, W.S., Edinburgh
1828 Gibson, John, jun., W.S., Edinburgh
1847 Gibson, John, Woolmet, Dalkeith
1853 Gibson, John, Eastfield, Wiston, Biggar
1860 Gibson, J., Tullochquhairn, Dumfries
1859 Gibson, Robert, Faldonside, Melrose
1863 Gibson, Thomas, Ferniehurst, Stow
1859 Gibson, Wm. W., 6 Albyn Place, Edin.
1865 Gilchrist, Dug., of Ospisdale, Dornoch
1842 Giles, James, Dresden
1848 Gilkison, Robert, jun., Glasgow
1854 Gillanders, J. F., of Highfield, Beauly
1836 Gillespie, Alex., Merchant, London
1841 Gillespie, David, of Mountquhannie, Cupar-Fife
1849 Gillespie, James, Craigie, Cramond
1850 Gillespie, Jas., Annanbank, Lockerbie
1860 Gillespie, James, Gateside, Douglas
1846 Gillespie, John, W.S., Edinburgh
1829 Gillespie, Robert, Merchant, London
1862 Gillison, Thomas, 3, Dryden Road, Liverpool
1848 Gillon, Andrew, of Wallhouse, Bathgate
1849 Gilmour, Allan, of Eaglesham, Glasgow
1863 Gilmour, John, of Mount Vernon, Row
1857 Gilmour, Matthew, Town of Inchinnan, Renfrew
1828 Gilmour, W. J. Little, of Craigmillar
1863 Gilmour, W. M., Shawburn, Hamilton
1855 Girdwood, Robert, Tanfield, Edinburgh
1841 Gladstone, R., Merchant, Liverpool
1853 Gladstone, Thomas Stewart, of Capenoch, Thornhill
1847 Glasgow, Alexander, of Old Court, Cork
1861 Glassford, J. G. Gordon, of Dougalston
1857 Glegg, John, Factor, Milliken House, Johnston
1847 Glen, John, late Merchant, Edinburgh
1860 Glen, Robert R., Banker, Linlithgow
1865 Glen, Robert C., Auchenback, Barrhead
1853 Glen, Thomas, Thornhill, Johnstone
1869 Glendinning, Alexander, Winchburgh
1849 Glendinning, G., Hatton Mains, Ratho
1861 Glendinning, G., Rawfarm, Mid-Calder
1848 Glendinning, Peter, Dalmeny Park, South Queensferry
1854 Glendinning, Robert W., Broomdykes, Ayton

Admitted
1851 Glennie, Arthur, Fernyflat, Bervie
1859 Glover, And., Lanrick Castle, Stirling
1857 Glover, Robert, Shandon, Drymen
1865 Goldie, R. G. M., Springfield, Biggar
1851 Goodlet, William, Bolshan, Arbroath
1846 Gordon, A. H., of Avochie, Edinburgh
1808 Gordon, Alexander, of Ellon
1850 Gordon, A. F., of Rayne, Edinburgh
1832 Gordon, C., of Auchleuchries, Peterhead
1866 Gordon, Chris., Douganhill, Dalbeattie
1835 Gordon, Vice-Admiral Charles, Huntly
1839 Gordon, Charles K. J., of Craig, K.L.S.
1860 Gordon, David A., of Culvennan, Castle-Douglas
1840 Gordon, Edward S., Q.C., Advocate, Edinburgh
1829 Gordon, George, America
1860 Gordon, G., Tullochallum, Craigellachie
1855 Gordon, H. G., Oriental Bank, London
1860 Gordon, Henry, Sheriff-Clerk, Dumfries
1835 Gordon, James, of Manar, Inverurie
1862 Gordon, Captain Jas. Alex., Ittingston, Huntly
1838 Gordon, John, of Aikenhead, Cathcart
1853 Gordon, John, Lettock, Glenlivet
1861 Gordon, John, of Cluny, Aberdeenshire
1858 Gordon, John, Uppertown of Towie, Mossat
1831 Gordon, John Taylor, of Nethermuir, New Deer
1846 Gordon, Robert Macartney, of Rattra, Kirkcudbright
1863 Gordon, R. H., Coul, Laggan
1863 Gordon, Thos. Dempster, of Balmaghie, Castle-Douglas
1847 Gordon, William, Aberdeen
1847 Gordon, W. Cosmo, of Fyvie, Aberdeen
1859 Gorrie, John, Innerdunning, Dunning
1866 Gough, Wm., Wykeham Abbey, York
1854 Gow, James, Bankend, Denny
1851 Gow, John L., Raith, Kirkcaldy
1860 Gowans, James, Rockville, Edinburgh
1853 Græme, Robert, of Welhall, Hamilton
1868 Græme, Robert, of Garvoch, Perthshire
1844 Graham, Alex., of Capilly and Lime-kilns, Barrhead
1862 Graham, Carolus J. Home, Edinburgh
1817 Graham, George, late of Cassafuar
1855 Graham, H., Auckland, New Zealand
1827 Graham, James, Toronto
1843 Graham, James, of Fereneze, Barrhead
1848 Graham, James Maxtone, of Redgorton, Perth
1851 Graham, James, Parcelstown, Westlinton, Carlisle
1862 Graham, James, Braidlie, Newcastleton
1863 Graham, James, Southbar, Paisley
1864 Graham, James, Myothill, Denny
1843 Graham, John, Pearsie, Kingoldrum
1852 Graham, John, of Shaw, Lockerbie
1842 Graham, John Murray, of Murrayshall, Perth

Admitted
1865 Graham, Paul, of Drynie, Inverness
1860 Graham, Robert, Hawick
1849 Graham, Thomas, of Ballewan, M.D., F.R.S., Master of the Mint, London
1834 Graham, Col. William, of Mossknow, Ecclefechan
1854 Graham, Wm., of Devonshaw, Dollar
1855 Graham, William, jun., Lairg
1833 Graham, William Stirling, of Airth, Falkirk
1869 Graham, Wm. C., Dunclutha, Dunoon
1853 Grahame, Barron, of Morphie, St Andrews
1861 Granger, John, Perth
1862 Grant, C., Hazelbrae, Glen Urquhart
1868 Grant, D. R. Lyall, of Kingsford, Aberdeen
1825 Grant, Duncan, of Bught, Inverness
1858 Grant, Francis William, Monymusk, Aberdeen
1869 Grant, Capt. Frederick G. Forsyth, of Ecclesgreig, Montrose
1852 Grant, Hay Macdowall, of Arndilly, Craigellachie
1828 Grant, Rev. James, D.C.L., D.D., Chaplain to the Society
1859 Grant, James, Clashnoir, Ballindalloch
1819 Grant, John, of Kilgraston, Bridge of Earn
1865 Grant, John, Mains of Pitgaveny, Elgin
1860 Grant, John, Burnside, Grandtully, Aberfeldy
1823 Grant, John Peter, W.S., Edinburgh
1853 Grant, Kenneth, Kinnellan, Dingwall
1836 Grant, Patrick, W.S., Sheriff-Clerk, Inverness
1865 Grant, Peter, Glassgreen, Elgin
1826 Grant, Robert, of Kincorth, Forres
1841 Grant, Robert, of Druminnor, Rhynie
1846 Grant, Thos. Macpherson, of Craigo, Montrose
1844 Grant, Walter Colquhoun, late Royal Scots Greys
1861 Grant, William, Spittal of Glenshee, Blairgowrie
1862 Grant, William, Drumdelgie, Huntly
1833 Grant, Wm., of Elchies, Craigellachie
1839 Grant, William, Australia
1821 Grant, W. P., of Rothiemurchus, Aviemore
1830 Grassick, Charles, late of Tillyprony
1829 Grassick, John, Aberdeen
1859 Gray, Alexander, Langholm
1856 Gray, Donald, Corrish, Golspie
1857 Gray, George, Windyyet, Avonbridge Falkirk
1858 Gray, G., Bogriffie, Fintray, Aberdeen
1868 Gray, George, Levenseat, Whitburn
1861 Gray, J., Braehead Mains, Cramond
1864 Gray, Jas., West Plean, Bannockburn
1868 Gray, James, Seedsman, Stirling
1831 Gray, John, Merchant, Helensburgh

Admitted
1856 Gray, John, Uddingston, Glasgow
1854 Gray, Patrick, Middle Strath, Falkirk
1854 Gray, Thomas, Coul, Markinch
1858 Gray, Thomas, of King's Grange, Dalbeattie
1849 Gray, Wm., Southfield, Duddingston, Edinburgh
1855 Gray, William, Brownrigg, Drem
1857 Green, William, Ruthrie, Craigellachie
1867 Greenshields, James, Westown, Lesmahagow
1851 Gregorson, Angus, Banker, Oban
1854 Gregory, Alex. Allan, Corn-Merchant, Inverness
1833 Gregory, Arthur Thomas, of Buchromb, Mortlach
1863 Greig, George, of Eccles, W.S., Edinburgh
1868 Greig, George, Harvieston, Stonehaven
1852 Greig, Thomas, of Glencarse, Perth
1861 Greig, T. Watson, of Muirshiels, Paisley
1854 Grey, Geo. A., Millfield Hill, Wooler
1851 Grierson, J., Brandedleys, Crocketford
1855 Grierson, James, of Dalgoner, Dunscore
1860 Grierson, J., Morton Mains, Thornhill
1860 Grierson, John, of Muirside, Holywood
1859 Grierson, Jos., Breoch, Castle-Douglas
1860 Grierson, Robt., Westmains, Mouswald, Dumfries
1859 Grierson, Wm., Tors, Castle-Douglas
1867 Grieve, D., Blackberry Hill, Whitburn
1858 Grieve, John, Castles, Dalmally
1859 Grieve, Michael, Coiletter, Tindrum
1857 Grieve, Robert, Glenfalloch, Arrochar
1857 Grieve, Robert, Mornish, Killin
1861 Grieve, Walter, Glendevon, Muckhart
1834 Grieve, W., Branxholm Park, Hawick
1854 Grieve, William, Skelfhill, Hawick
1858 Grigor, James D., Wester Alves, Forres
1847 Grigor, John, Forres Nurseries, Forres
1865 Grigor, William, of Seabank, Elgin
1861 Guild, Andrew, Coulshill, Auchterarder
1868 Guild, James, Balgone, North Berwick
1868 Guild, James Wyllie, C.A., Glasgow
1856 Gulston, Alan Jas., of Dirleton, Llangadock
1850 Gunn, Alexander, Dale, Thurso
1856 Gunn, Alexander, Dornoch
1866 Gunn, Charles, late 2 Park Circus, Glasgow
1864 Gunn, Don., Brahan Cottage, Dingwall
1839 Gunn, James, Sibster, Wick
1868 Gunn, John, Ardmaddy Castle, Oban
1849 Gunn, Marcus, Culgower, Golspie
1867 Guthrie, Col. Charles Seton, of Scotscalder, Thurso
1850 Guthrie, David, 377 High Street, Edin.
1854 Guthrie, David, Banker, Stranraer
1836 Guthrie, John, of Guthrie, Forfar
1857 Guthrie, Robert, Crossburn, Troon
1834 Gwynne, Alban Thomas Jones, of Monachty, Cardigan

Admitted
1865 Hamilton and Brandon, His Grace the Duke of
1843†Home, Right Hon. the Earl of
1841†Haddington, Right Hon. the Earl of
1853 Hopetoun, Right Hon. the Earl of
1830 Herries, Right Hon. Lord
1844 Halliburton, Right Hon. Lord John
1825†Hamilton, Right Hon. R. C. Nisbet
1832 Hope, Sir Archibald, of Pinkie, Bart.
1867 Hay, Sir Robert, of Haystoun, Bart.
1848 Hay, Sir John C. Dalrymple, of Park Place, Bart., M.P.
1849 Hall, Sir James, of Dunglass, Bart.
1837 Hepburn, Sir Thomas Buchan, of Smeaton, Bart.
1868 Hope, Admiral Sir James, of Carriden, G.C.B., Linlithgow
1857 Haddon, Alex., Honeyburn, Hawick
1854 Hadwen, S., Kildonan Lodge, Golspie
1862 Hagart, Col., late of Edinburgh
1844 Haggart, James V., of Glendelvine, Edinburgh
1841 Haig, J., Cameron House, Windygates
1869 Haig, W. H., Cameron House, Windygates
1857 Haig, Wm., Kincaple, Cupar-Fife
1861 Hain, David, Balgove, St Andrews
1859 Haldane, Robert, Fernielee, Galashiels
1864 Halkett, Jas., Auchentender, Forgue
1864 Halkett, John Craigie, yr. of Cramond
1861 Hall, Alex., Rhynd, Leuchars, Fife
1855 Hall, Andrew, Braerich, Golspie
1846 Hall, Henry, Coul, Dornoch
1868 Hall, Jas., Frederick Street, Aberdeen
1841 Hall, John, Scribercross, Golspie
1853 Hall, Col. Thos., of Killean, Tayinloan
1867 Hallen, J. H. B., M.R.C.S.E., Staff-Vet. Surgeon, H.M. Bombay Army
1865 Halliday, Thomas, Rosehall Foundry, Haddington
1861 Halley, Andrew, Millhole, The Cairnies, Perth
1868 Halley, George, New Mills, Culross
1868 Hamilton, Claud Hamilton, Preston Hall, Dalkeith
1861 Hamilton, Daniel, 66 Hutchison Street, Glasgow
1853 Hamilton, Hugh, of Pinmore, Girvan
1865 Hamilton, James, Wallace Bank, Kilmarnock
1839 Hamilton, John, of Sundrum, Coylton
1846 Hamilton, John, of Greenbank, Newton Mearns
1860 Hamilton, John, Longrig, Torthorwald
1864 Hamilton, J., Monktonhill Farm, Ayr
1846 Hamilton, John Buchanan, of Leny, Callander
1857 Hamilton, John G. Carter, of Dalzell, M.P., Hamilton
1858 Hamilton, John G., Hafton House, Dunoon
1865 Hamilton, J. B., Burnhouse, Carnwarth

Admitted
1827 Hamilton, Lt.-Col. Ferrier, of Cairnhill, Kilmarnock
1848 Hamilton, Major Ferrier, yr. of Cairnhill, Edinburgh
1842 Hamilton, Robt., W.S., Kames Cottage, Rothesay
1823 Hamilton, Wm., Merchant, Glasgow
1864 Hamilton, Wm., Overton, Wishaw
1852 Hamilton, W. C., of Craighlaw, Wigtown
1859 Hamilton, Wm. F., Callendar, Falkirk
1864 Hamilton, Rev. Z. M., D.D., Bressay, Shetland
1863 Handyside, D., Crosshall, Coldstream
1843 Handyside, W., of Cornhill, 11 Claremont Crescent, Edinburgh
1861 Hanning, John, Boghead, Mouswald
1854 Hannam, J., Kirk Deighton, Wetherby
1858 Hannay, John, Corskie Bank, Banff
1833 Harden, Robert Allan, 6 Doune Terrace, Edinburgh
1851 Hardie, George, Australia
1851 Hardie, Robert, Harrietfield, Kelso
1863 Hardie, W. H., Bo'ness Mains, Linlithgow
1849 Hare, Stuart Bayley, of Calderhall, Mid-Calder
1864 Harkness, W. M. J., Granton, Moffat
1853 Harper, Frank, Dingwall
1867 Harper, Joseph, Snawdon, Gifford
1857 Harper, Robert, Edmonston Mains, Liberton
1864 Harris, Richard H., Earnhill, Forres
1857 Harris, Thomas, Dalmarnoch, Dunkeld
1867 Harris, William, Tirinie, Aberfeldy
1864 Harrison, George, 12 Blackford Road, Edinburgh
1846 Harrop, I. Worthington, New Zealand
1869 Hart, J. Christine, of Dumcrosshall, Dunach, Oban
1838 Harvey, Arthur, Port Natal
1846 Harvey, C. W., Merchant, Liverpool
1850 Harvey, George, Whittingham Mains, Prestonkirk
1858 Harvey, James, Pottertown, Bellhelvie
1854 Harvey, J. H., Pitgersie, Foveran, Ellon
1809 Harvey, J., of Tiningly Park, Yorkshire
1845 Harvey, J. Inglis, of Kinnettles, Forfar
1852 Harvie, Rev. W., of Brownlee, Carluke
1860 Hathorn, John Fletcher, of Castlewigg, Whithorn
1864 Hay, Alexander, Trochelhill, Fochabers
1861 Hay, Alexander, Salesman, Perth
1862 Hay, Col. A. S. Leith, of Rannes, C.B., Leith Hall, Kennethmont
1865 Hay, C., Callumkill, Port-Ellen, Islay
1862 Hay, Colonel Drummond, of Seggieden, Perth
1841 Hay, Geo. W., of Whiterigg, Sudbury
1862 Hay, Captain J. G., of Belton, Dunbar
1862 Hay, James, Scrabster, Thurso
1828 Hay, James, Merchant, Leith
1858 Hay, James, jun., Little Ythsie, Tarves

Admitted
1855 Hay, J., Nether Mill of Tillyhilt, Tarves
1834 Hay, John, of Letham Grange, Arbroath
1868 Hay, Major John, of Hopes, Gifford
1846 Hay, Samuel, Manager, Union Bank of Scotland
1819 Hay, William, of Dunse Castle, Dunse
1853 Hay, William, of Chapel, Drem
1869 Hay, William, 7 Hill Street, Edinburgh
1857 Hebden, Robt. J., of Eday, Kirkwall
1863 Hector, David, Sheriff of Wigtown and Kirkcudbright
1848 Hector, Robert, Montrose
1863 Heddle, J. G., of Melsetter, Kirkwall
1859 Heggie, Walter, Kirkcaldy
1837 Henderson, Alexander, Longniddry
1847 Henderson, Alex., of Stemster, Thurso
1854 Henderson, Charles, Abbotrule, Bonchester Bridge
1847 Henderson, Charles J., Corn Merchant, Leith
1854 Henderson, David, of Abbotrule, Bonchester Bridge
1850 Henderson, D., of Gattaway, Newburgh
1854 Henderson, Geo., East Gordon, Kelso
1860 Henderson, George, Garroch, Troqueer, Dumfries
1839 Henderson, James, of Bilbster, Wick
1863 Henderson, Jas., Netherraw, Lilliesleaf
1860 Henderson, James, Kelloside, Sanquhar
1839 Henderson, J., W.S., Banker, Thurso
1850 Henderson, John, Byres, Haddington
1854 Henderson, John, Middlethird, Kelso
1859 Henderson, John, Humbie Mains, Blackshiels
1858 Henderson, Robt., Lawrencehill, Alloa
1854 Henderson, Thos., Chesterhill, Dalkeith
1851 Henderson, William, Craigarnhall, Bridge of Allan
1861 Henderson, W., Milton, Coupar-Angus
1868 Henderson, Wm., Redbog, Strichen
1862 Hendrie, John, Kirkwood Colliery, Coatbridge
1865 Hendrie, J., Castle Heather, Inverness
1863 Hepburn, J., Preston Mains, Prestonkirk
1858 Hepburn, John, Keithfield, Tarves
1845 Hepburn, John Buchan, late of Castle Dykes
1810 Hepburn, J. Stewart, of Colquhalzie, Auchterarder
1859 Hepburn, William Rickart, of Rickarton, Stonehaven
1851 Heriot, F. L. Maitland, of Ramornie, Sheriff of Forfar
1863 Herriot, James, Leetside, Whitsome, Chirnside
1853 Herries, Alex. Young, yr. of Spottes, 16 Heriot Row, Edinburgh
1823 Herries, W. Young, of Spottes, Edin.
1857 Hewat, Richard, Writer, Castle-Douglas
1862 Hewetson, J., Auchenbenzie, Thornhill
1863 Higgins, Robert, Ninewar, Prestonkirk
1868 Highet, Robert, Merchant, Garlieston

Admitted
1861 Hill, Alex., of Stonywynd, Boarhills, St Andrews
1823 Hill, George Gosset, Merchant, London
1847 Hill, James Lawson, W.S., Edinburgh
1861 Hill, James, Bradestone, Meigle
1850 Hill, John, Easter Carlowrie, Cramond
1838 Hill, Lawrence, Writer, Glasgow
1851 Hill, Robert, Navidale, Helmsdale
1865 Hill, Robert, W.S., Edinburgh
1868 Hill, John, Whitehill, Lasswade
1863 Hilson, Geo., jun., Solicitor, Jedburgh
1860 Hilton, Henry of Fairgirth, Dalbeattie
1854 Hislop, Robert, jun., Prestonpans
1862 Hobkirk, James, Broadhaugh, Hawick
1850 Hodgson, R., of Carham, Coldstream
1860 Hog, Thos. A., of Newliston, Kirkliston
1842 Hogarth, George, Banker, Cupar-Fife
1863 Hogarth, Geo., Eccles Tofts, Greenlaw
1863 Hogg, Henry, Symington Mains, Stow
1859 Hogg, Robert, Rosemay, Penicuik
1854 Hogg, Thomas, Hillhouse, Coldstream
1858 Hogg, Thomas, Cakemuir, Ford
1836 Home, David Milne, of Wedderburn, Paxton House, Berwick
1829 Home, Francis, Sheriff-Substitute, Linlithgow
1831 Home, G. H. M., Binning, of Argaty, Doune
1852 Home, Lieut.-Col. G. Logan, of Broomhouse, Dunse
1857 Honeyman, John, Steephill, Ventnor, Isle of Wight
1858 Hood, Archibald, Coal Manager, Whitehill, Lasswade
1857 Hood, James, late Newmains, Prestonkirk
1827 Hood, John, of Stoneridge, Coldstream
1859 Hood, John, Townhead, Cockburnspath
1861 Hood, John, Linross, Kirriemuir
1854 Hood, T., Coldstream Mains, Coldstream
1851 Hope, Andrew, Edinburgh
1848 Hope, George, Fenton Barns, Drem
1865 Hope, Henry W., of Luffness, Drem
1847 Hope, James, Duddingston, Edinburgh
1848 Hope, J., of Belmont, W.S., Edinburgh
1851 Hope, J. H., South Elphinstone, Tranent
1859 Hope, Wm., 51 Timber Bush, Leith
1860 Horn, J., of Pitmedden, Oyne, Aberdeen
1851 Horn, Robert, Advocate, Edinburgh
1861 Horn, Robert, Roseville, Duddingston, Edinburgh
1864 Horncastle, Henry, Edwinstowe, Ollerton, Notts
1817 Horne, Donald, W.S., Edinburgh
1846 Horne, Major Jas., of Stirkoke, Wick
1851 Horne, T. E. Ogilvie, W.S., Edinburgh
1858 Hornsby, Richard, Grantham
1841 Horsburgh, R., of Southbank, Penicuik
1853 Hosack, William, Barcaldine, Bonaw
1865 Hosack, John, Dochcarty, Dingwall
1865 Houldsworth, Henry, jun., Glasgow
1868 Houldsworth, J., of Coltness, Motherwell

Admitted
1865 Houldsworth, J. M., Craigforth, Stirling
1857 Houldsworth, Joseph Henry, Glasgow
1865 Houldsworth, T., of Farnsfield, Notts
1857 Houldsworth, William, Glasgow
1857 Houston, John, Geilston, Cardross
1845 Houstoun, Colonel A., of Clerkington, Haddington
1854 Houstoun, Wm., Kintradwell, Golspie
1859 Howard, J. (J. & F. Howard), Bedford
1865 Howatson, Charles, of Dornel, Auchinleck, Ayr
1865 Howden, John, Seedsman, Inverness
1864 Howden, John, Overseer, Nether Braco, Perthshire
1850 Howden, Robert, Boggs, Pencaitland
1854 Howe, Alexander, W.S., Edinburgh
1863 Howie, H. Brown, Detchant, Belford
1863 Howie, James, Haddon, Kelso
1857 Howie, John, Muirhouse, Kilmarnock
1855 Hoyle, Duncan, London
1822 Hozier, J., of Mauldslie Castle, Carluke
1862 Hozier, W. W., Tannochside, Bellshill
1853 Hubback, Joseph, Liverpool
1851 Hubback, Thomas, Sunlawshill, Kelso
1865 Hudspith, Wm., Wishaw, Motherwell
1844 Huggins, W. B., Glasgow
1860 Hughan, Peter, Cults, Garlieston
1838 Hughan, Thomas, of Airds
1857 Huie, James, Durry, Campbeltown
1818 Hume, M. N. Macdonald, W.S., Edinburgh
1840 Hume, P. Hallyburton, Lawfield, Cockburnspath
1859 Hunt, James Alex., of Pittencrieff, Dunfermline
1859 Hunt, Jas., of Navity, W.S., Edinburgh
1863 Hunt, Thos., Thornington, Coldstream
1855 Hunter, Alex., St Colmac, Rothesay
1855 Hunter, Alexander, Nethershiel, Ratho
1826 Hunter, David, of Blackness, Dundee
1867 Hunter, David, Guiltreehill, Maybole
1860 Hunter, Evan Alan, W.S., Edinburgh
1861 Hunter, Herbt., of Burnhead, Lockerbie
1867 Hunter, James, Coplawhill, Strathbungo, Glasgow
1823 Hunter, Lt.-Col. Jas., of Auchterarder
1852 Hunter, James, of Glenapp, Coltness, Motherwell
1842 Hunter, Jas. Wm., of Thurston, Dunbar
1842 Hunter, Jn., Oxenford Mains, Ormiston
1857 Hunter, Jn., New Banchory, Banchory
1864 Hunter, John, Dipple, Fochabers
1837 Hunter, Richard, 10 Ainslie Pl., Edin.
1843 Hunter, Robert, Sheriff of Bute and Dumbarton
1854 Hunter, Robert, Dalhousie Chesters, Lasswade
1867 Hunter, Robert A., Lephinstrath, Campbeltown
1862 Hunter, Robt., 10 Ainslie Place, Edin.
1860 Hunter, William G., Dumfedling, Langholm

Admitted
1853 Hunter, William, Haugh, Kirkliston
1857 Hunter, William, Mackribeg, Campbeltown
1859 Husband, Robert, Gellet, Dunfermline
1838 Hutchinson, James, Merchant, Glasgow
1857 Hutchison, James, Townhead, Mouswald, Dumfries
1829 Hutchison, R., of Cairngall, Longside
1850 Hutchison, Robert, Kirkcaldy
1858 Hutchison, R., of Carlowrie, Kirkliston
1868 Hutton, A., Comlongan Castle, Annan
1866 Hutton, John, Newhall, Crail
1859 Hyndman, Henry C., of Springside, West Kilbride
1857 Hyslop, H. D. B., Tower, Sanquhar

1852 Inglis, Right Hon. John, of Glencorse, Lord Justice-General
1838 Innes, Sir J. Milne, of Edingight, Bart.
1855 Inch, John, West Mains, Liberton
1834 Inglis, Chs. Craigie Halkett, of Cramond
1864 Inglis, George, Dron, Cupar-Fife
1847 Inglis, Harry Maxwell, of Logan Bank, P.C.S.
1849 Inglis, Henry, of Torsonce, W.S., Edin.
1856 Inglis, Lieut.-Col. Hugh, of Kingsmills, Inverness
1860 Inglis, John, Steam Mills, Musselburgh
1857 Inglis, John, of Redhall, Slateford
1864 Inglis, John, Spittalton, Gargunnock
1865 Inglis, Peter, East Pilton, Edinburgh
1857 Inkson, Patrick, Berryleys, Keith
1840 Innes, Alex., of Raemoir, Stonehaven
1842 Innes, Alexander Mitchell, of Ayton
1840 Innes, Cosmo, P.C.S., Edinburgh
1865 Innes, Frederic S. Bentley, of Thrumster, Golspie
1865 Innes, William Mitchell, yr. of Ayton
1847 Innes, Geo. Mitchell, of Bangour, Edin.
1847 Innes, John B., W.S., Edinburgh
1846 Innes, Thomas, of Learney, Torphins
1842 Innes, Thos. S. Mitchell, of Phantassie, Prestonkirk
1862 Innes, T. G. Rose, of Netherdale, Turriff
1858 Ironside, John, Brindy, Whitehouse, Aberdeen
1859 Ironside, William, Clofrickford, Ellon
1845 Irvine, Alex. Forbes, of Drum, Aberdeen
1869 Irvine, Walt., Grangemuir, Pittenweem
1843 Irvine, Wm. Stewart, M.D., Pitlochrie
1844 Irving, Geo. Vere, of Newton, Abington
1860 Irving, J., Carco, Kirkconnel, Sanquhar
1838 Irving, John, London
1869 Irving, J. Bell, of Whitehill, Lockerbie

1831 Jerviswoode, Hon. Lord
1842 Johnstone, Hon. Henry Butler, of Corehead
1823 Jardine, Sir William, of Applegarth, Bart.
1859 Johnstone, Admiral Sir Wm. J. Hope, K.C.B., Edinburgh

Admitted
1848 Johnston, Sir William, of Kirkhill, Gorebridge
1864 Jack, John S., Carrat, Stirling
1863 Jack, M., Peggy's Mill, Cramond Bridge
1860 Jack, Samuel, Dreghorn Mains, Colinton
1854 Jack, Robt., North Gyle, Corstorphine
1855 Jack, Robert, Dalziel, Motherwell
1863 Jackson, Edward J., 6 Coates Crescent, Edinburgh
1859 Jackson, John, of Amisfield, Dumfries
1859 Jackson, John, Bush, Langholm
1858 Jaffray, John, Bank Agent, Dunbar
1852 Jameson, Melville, Solicitor, Perth
1869 Jamieson, Alexander, C.A., Edinburgh
1858 Jamieson, David, Mains of Auchmithie, Arbroath
1860 Jamieson, Geo. Auldjo, C.A., Edinburgh
1857 Jamieson, James Fife, Glasgow
1860 Jamieson, Jn., of Fingask, St Andrews
1861 Jamieson, Richard, Holm, Carsphairn
1865 Jamieson, Michael J., of Arngomery, Stirling
1858 Jamieson, Wm. H., Straiton, Liberton
1846 Jardine, Andrew, of Lanrick, Stirling
1850 Jardine, Alexander, yr. of Applegarth, Lockerbie
1846 Jardine, James, of Larriston, Dryfeholm, Lockerbie
1854 Jardine, John, of Thorlieshope, Newcastleton
1860 Jardine, Robt., of Balgray, Lockerbie
1863 Jardine, Robert, of Castlemilk, M.P., Lockerbie
1868 Jarrat, John, Dalmally, Inverary
1864 Jeffray, A. G., Ballindalloch Mills, Balfron
1862 Jeffray, W. Allan, Braehead, Dalswinton
1857 Jeffrey, John, Glasgow
1859 Jeffrey, John, of Balsusney, Kirkcaldy
1855 Jobson, William, Buteland, Hexham
1836 Johnston, Alexander, W.S., Pitlurg House, Ellon
1852 Johnston, Alexander, Hailes, Slateford
1853 Johnston, George, Marlefield, Kelso
1854 Johnston, James, Cappleglll, Moffat
1856 Johnston, James, Letham Mains, Haddington
1857 Johnston, James, Huntington, Lauder
1833 Johnston, John, late Factor for the Earl of Glasgow
1856 Johnston, John, jun., Ballencrieff Mains, Bathgate
1853 Johnston, J. S., Crailinghall, Jedburgh
1839 Johnston, Robt., Merchant, Aberdeen
1860 Johnston, Lieut.-Gen., of Carnsalloch, Dumfries
1852 Johnston, William, Writer, Bathgate
1857 Johnston, Wm., Ranachan, Campbeltown
1857 Johnstone, Charles, Fans, Bonaw
1850 Johnstone, Christopher, Dinwoodie Lodge, Lockerbie

Admitted
1857 Johnstone, G., M.D., Fincraigs, Newport
1860 Johnstone, James, Banker, Dumfries
1828 Johnstone, James, of Alva, Stirling
1860 Johnstone, J. Bell, Holstane, Thornhill
1859 Johnstone, John A., Archbank, Moffat
1824 Johnstone, J. Jas. Hope, of Annandale, Raehills, Lockerbie
1865 Johnstone, Miss Hope, of Annandale, Marchbank, Moffat
1859 Johnstone, Robert, Polmoodie, Moffat
1859 Johnstone, Thomas, Lochhouse, Moffat
1859 Johnstone, Walter, Archbank, Moffat
1829 Jolly, David Leitch, Banker, Perth
1862 Jones, Charles Digby, Aberfoyle
1834 Jopp, Alexander, Advocate, Aberdeen
1858 Jopp, Robert, New Zealand
1865 Joss, Alexander, Cruichie, Huntly
1865 Joss, John, Budgate, Cawdor, Nairn

1863 KELLIE, Right Hon. the Earl of
1853 KINNOULL, Right Hon. the Earl of
1850†KINTORE, Right Hon. the Earl of
1830†KINNAIRD, Right Hon. Lord, K.T.
1862 KINNAIRD, Hon. Arthur, M.P.
1812 KENNEDY, Right Hon. T. F., of Dunure
1869 KERR, Right Hon. Lord Schomberg
1864 KINLOCH, Hon. Lord
1828 KINLOCH, Sir David, of Gilmerton, Bart.
1858 Kay, Charles, Forres
1864 Kay, James, Hillhead, Gargunnock
1863 Kay, John, Softlaw, Kelso
1867 Kay, Robert, Tuns, Minard, Inveraray
1863 Kay, William, Viewbank, Lasswade
1844 Kaye, Robert, of Millbrae, Moodiesburn
1844 Keir, Andrew T., late Noss, Wick
1864 Keir, Duncan, Bucklyvie
1837 Keir, Patrick Small, of Kindrogan, Pitlochrie
1857 Keir, Simon, Burnside, Elgin
1859 Keir, William, of Whitehaugh, Newcastleton
1869 Keir, William A., yr. of Kindrogan, Pitlochrie
1865 Keith, Peter, Factor, Barrogill Castle, Thurso
1857 Kemp, J., Balnaglack, Petty, Inverness
1852 Kemp, Jn., Implement Maker, Stirling
1838 Kennedy, Donald, Newton, Evanton
1863 Kennedy, David, Newlands, Kirkmahoe
1866 Kennedy, Duncan C., of Glenstriven, Innellan
1865 Kennedy, Henry H., London
1832 Kennedy, Capt. Hew F., of Bennane, Girvan
1859 Kennedy, James, of Sandayhill, Brandleys, Sanquhar
1850 Kennedy, James, New Zealand
1846 Kennedy, John Lawson, of Knocknaling, Dalry
1861 Kennedy, Robert, Ballechin, Dunkeld
1842 Kennedy, William, Glasgow
1862 Kennedy, William, W.S., Edinburgh

Admitted
1860 Kennoway, Robt., Burnhead, Lasswade
1863 Ker, E. Martin, of Gateshaw, Morebattle, Kelso
1854 Ker, Robert, of Achinraith, Hamilton
1864 Kerr, Abram, Castlehill, Thornhill
1858 Kerr, A., of Scroggiehill, Castle-Douglas
1843 Kerr, Chris., of Arthurstone, Dundee
1853 Kerr, John, Land-Surveyor, Dunse
1859 Kerr, John, Bloom, Mid-Calder
1860 Kerr, John, Brocklehirst, Mouswald, Dumfries
1857 Kerr, Robt, of Chapeldonan, Edinburgh
1860 Kerr, Thomas, Whitehill, Sanquhar
1845 Kerr, William Williamson, late Oriel College, Oxford
1854 Kerr, Wm., Wester Causewayend, Mid-Calder
1833 Kerr, W. S., of Chatto, Sunlaws, Kelso
1865 Kidd, Alexander F., National Bank, Burntisland
1858 Kidd, J., Grange of Barry, Carnoustie
1858 Kidd, John, Midscryne, Carnoustie
1844 Kidston, Archibald G., Glasgow
1850 Kidston, Jn. P., of Cairns, Cambuslang
1864 Kier, Thomas, Newlands, Falkirk
1826 Kilgour, Robert, jun., late Millbank, Aberdeen
1862 Kilpatrick, P., Balgownie Mains, Culross
1868 King, Charles M., Antermony House, Milton of Campsie
1864 King, David, Roseneath
1857 King, James, yr. of Campsie, Levernholm, Hurlet
1850 King, Jas. F., 5 Richmond St., Glasgow
1857 King, John, Braco, Airdrie
1860 King, John H., of the Lodge, Balerno
1839 King, Wm., Manufacturer, Glasgow
1868 King, Major Wm. Ross, of Tertowie, Kinellar
1859 Kininmonth, Peter, Milton, Leuchars
1859 Kinloch, Alex., yr. of Gilmerton, Drem
1841 Kinloch, Alex. John, of Park, Aberdeen
1825 Kinloch, George, of Kinloch, Meigle
1829 Kinloch, Col. Jn., of Kilrie, Kirriemuir
1824 Kinnear, Chas., of Kinloch, Ladybank
1864 Kinross, J., Gunnochan, Braco, Perthshire
1848 Kirk, John, W.S., Edinburgh
1861 Kirk, James, Kaimknow, Muckart
1844 Kirkcaldy, George D. H., of Hearnesbrook, Ireland
1868 Kilpatrick, A., St Andrew St., Glasgow
1860 Kirkpatrick, Samuel, West Roucan, Torthorwald
1854 Kirkwood, Hugh, Killermont, Maryhill, Glasgow
1854 Kirkwood, J., Implement-Maker, Tranent
1866 Kirkwood, Alex., Edinburgh, Medalist to the Society
1858 Knight, Robert, Middleton, Fintray
1867 Knight, Wm. Gray, of Jordanstone, Perthshire
1858 Knowles, Thomas, Flesher, Aberdeen

Admitted
1851 LEINSTER, His Grace the Duke of, K.P., Honorary Member
1854†LOTHIAN, Most Noble the Marquis of
1863 LAUDERDALE, Right Hon. the Earl of
1820†LOVAT, Right Hon. Lord, K.T.
1862 LESLIE, Hon. George Waldegrave
1853 LOVAT, Hon. Simon Fraser, Master of
1865 LOCKHART, Sir Norman Macdonald, of Lee, Bart.
1861 LOW, General Sir John, of Clatto, K.C.B.
1844 LUMSDEN, Sir James, Lord Provost of Glasgow
1863 Laidley, J. W., of Seacliffe, North Berwick
1863 Laing, George, Cornhill, Coldstream
1856 Laing, John, Newburgh, Fife
1855 Laing, Thomas, Yorkston, Gorebridge
1833 Laird, David, Belmont Castle, Meigle
1858 Laird, George W., Denfield, Arbroath
1850 Lamont, James, of Knockdow, Innellan
1866 Lamont, Jn., 12 Henderson Row, Edin.
1854 L'Amy, John Ramsay, of Dunkenny, Netherbyres, Ayton
1855 Landale, Andrew, Easthall, Cupar-Fife
1857 Landale, James, Woodmill, Falkland
1855 Landale, Thomas, Easter Rhind, Perth
1867 Lang, Alex., Botherickfield, Houston
1849 Lang, Hugh M., Broadmeadows, Selkirk
1859 Lang, John, Selkirk
1864 Lang, John, Bield, Gargunnock
1854 Lang, William, of Groatholm, Largs
1854 Langlands, Jas. C., Berwick, Alnwick
1857 Latham, Patrick R., Knock, Mull, Oban
1864 Latta, Mat. Rodger, Carmyle, Glasgow
1868 Lauder, Alex., Goshen, Musselburgh
1859 Lauder, Dewar, Kinkell, St Andrews
1860 Laurence, George W., Largnean, Haugh of Urr
1859 Laurie, James, Mitchelston, Stow
1848 Laurie, William Kennedy, of Woodhall, Castle-Douglas
1864 Laurie, A. Campbell, of Moss, Killearn
1868 Law, James, East Mains, Broxburn
1868 Lawes, J. B., Rothamstead, St Albans
1853 Lawson, Alexander, of Burnturk, Kettle
1843 Lawson, Alexander, Merchant, Dundee
1854 Lawson, Alexander, Old Mills, Elgin
1868 Lawson, Andrew Murray, 1 George IV. Bridge, Edinburgh
1830 Lawson, Charles, of Borthwick Hall, Gorebridge
1846 Lawson, C., yr. of Borthwick Hall, Edin.
1868 Lawson, C., Ordhead, Cluny, Aberdeen
1868 Lawson, George Stoddart, 1 George IV. Bridge, Edinburgh
1859 Lawson, Henry Graham, 1 George IV. Bridge, Edinburgh
1867 Lawson, Thos., of Carriston, Markinch
1853 Lawson, Wm., Lessendrum, Huntly
1858 Learmonth, Alex., North Bank, Bo'ness
1860 Learmonth, Lieut.-Col. Alex., of Dean
1824 Learmonth, T., Parkhall, Linlithgow

Admitted
1863 Lee, John, Oakwood, Selkirk
1855 Lees, John, Marvingston, Haddington
1863 Lees, Richard, Drinkstone, Hawick
1861 Lees, R., of Fens, Leabrae, Galashiels
1823 Leigh, Rev. Peter, Golborne Park, Lancashire
1864 Leishman, James, of Broomrig, Dollar
1864 Leishman, T., Meiklewood, Gargunnock
1858 Leitch, Arch. K., Inchstelly, Forres
1841 Leith, Alex., of Freefield, Old Rayne
1869 Leith, Major Thomas, Westhall, Oyne
1857 Lennie, John, Long Newton, Gifford
1865 Leny, W. M., of Dalswinton, Dumfries
1858 Leslie, Colonel, of Balquhain, K.H., Keith-Hall
1858 Leslie, C., yr. of Balquhain, Keith-Hall
1840 Leslie, G. A. Y., of Kininvie, Mortlach
1857 Leslie, James, Thorn, Blairgowrie
1868 Leslie, James, Selby, Keith-Hall
1868 Leslie, Lieut.-Col. Jonathan Forbes, of Rothie Norman, Rothie
1848 Leslie, Wm., of Warthill, Old Rayne
1863 Lesslie, James, Boghall, Linlithgow
1863 Lewis, James, 1 George Sq., Edinburgh
1869 Liddell, Rev. John R., The Manse, Kirkliston
1864 Lidderdale, William H., Writer, Castle-Douglas
1858 Ligertwood, John, Sheriff-Clerk of Aberdeenshire
1858 Ligertwood, Lewis, Bracklay, Methlic
1841 Lindsay, Alexander K., of Balmungo, St Andrews
1843 Lindsay, D., Ardargie, Bridge of Earn
1857 Lindsay, James, New Zealand
1846 Lindsay, J. Mackenzie, W.S., Edinburgh
1865 Lindsay, John, Thornhill, Stewarton
1857 Lindsay, Thos., Flemington, Leadburn
1854 Lindsay, Wm., 7 Hermitage Hill, Leith
1855 Lindsay, W., Stanhope, Rachan Mill
1863 Lithgow, E., Bedshiel, Greenlaw, Dunse
1857 Lithgow, Wm., Stanmore House, Lanark
1859 Little, John, Meikleholmside, Moffat
1863 Livingston, Thomas S. Fenton, of West Quarter, Airdrie
1853 Loch, George, Q.C., M.P., London
1861 Lochhead, T., Gortanansaig, Innellan
1832 Lockhart, Allan Eliott, of Borthwick Brae, Hawick
1846 Lockhart, James Sinclair, of Castlehill
1857 Lockhart, Rev. Laurence, D.D., of Milton-Lockhart, Carluke
1866 Lockhart, Robert, jun., 5 Washington Street, Glasgow
1859 Lockie, Wm., West Morriston, Earlston
1831 Logan, Alexander, London
1854 Logan, David, Fairney Castle, Ayton
1852 Longmore, Andrew, Rettie, Banff
1837 Longmore, John Alex., W.S., Edinburgh
1858 Longmore, William, Banker, Keith
1865 Lorimer, J., Achrossan, Tigh-na-bruaich
1843 Lorimer, T. W., Belkie, Auchterarder

Admitted
1860 Lorimer, William, Rigg, Kirkconnell
1857 Lovie, Alex., Nether Boyndlie, Fraserburgh
1843 Low, James, Berrywell, Dunse
1854 Low, James, Yonderton, Ellon
1861 Lowe, Robert, General Agent, Perth
1858 Lowden, John M., of Cocklick, Clonyards, Dalbeattie
1864 Lowis, John, of Plean, Stirling
1850 Lowndes, James, of Arthurlee
1864 Lucas, Robt., Cornton, Bridge of Allan
1859 Luke, John, of Brownhills, Muircambus, Colinsburgh
1837 Lumsdaine, Rev. Edwin S., of Blanerne
1862 Lumsdaine, Stamford R., of Lathallan, Colinsburgh
1861 Lumsden, David, Pitcairnfield, Perth
1850 Lumsden, G., Leslie Lodge, Keith-Hall
1857 Lumsden, George, Glasgow
1840 Lumsden, James, Braco, Keith
1851 Lumsden, Colonel Thomas, of Belhelvie, C.B.
1841 Lumsden, William James, of Balmedie, Belhelvie
1861 Lyal, Robert, Farmhall, Bridge of Earn
1850 Lyall, Charles, Old Montrose, Montrose
1854 Lyall, David, of Gallery, Montrose
1868 Lyall, J. W., *Perthshire Journal*, Perth
1850 Lyall, Robert, Carcary, Brechin
1859 Lyell, John, M.D., Newburgh
1861 Lyell, John, Banker, Newburgh
1836 Lyell, Thomas, of Shielhill, Kirriemuir
1859 Lyon, James, Burnhaugh, Netherley, Stonehaven
1867 Lyon, G. F., of Kirkmichael, Dumfries

1821*Montrose, His Grace the Duke of, K.T.
1846 Morton, Right Hon. the Earl of
1833†Mansfield, Rt. Hon. the Earl of, K.T.
1863 Minto, Right Hon. the Earl of
1865 Murray, Right Hon. Lord James
1856 Melville, Lieut.-General the Right Hon. Henry, Viscount, K.C.B.
1865 Middleton, Right Hon. Lord
1833 Mackenzie, Right Hon. Holt
1846 M'Neill, Right Hon. Sir John, G.C.B.
1830 Maxwell, Hon. Marmaduke C., of Terregles
1838 Maxwell, Hon. Henry Constable, of Milnehead
1839 Menzies, Hon. Lady, of Menzies
1847 Mure, Hon. Lord
1846 Manor, Hon. Lord
1840 Mansel, Sir John, Bart.
1841 Menzies, Sir Robert, of Menzies, Bart.
1862 Murray, Sir Patrick Keith, of Ochtertyre, Bart.
1840 Maxwell, Sir W., of Monreith, Bart.
1841 Maxwell, Sir Wm. Stirling, of Polloc, Bart., Honorary Secretary of the Society
1839 Maxwell, Sir John Heron, of Springkell, Bart.

Admitted
1843 Moncreiffe, Sir T., of Moncreiffe, Bart.
1854 Mackenzie, Sir Kenneth Smith, of Gairloch, Bart.
1838 Mackenzie, Sir James J. Randoll, of Scatwell, Bart.
1841 Mackenzie, Right Hon. Lady Anne, of Scatwell
1846 Murray, Sir John, of Philiphaugh, Bart.
1843 Montgomery, Sir Graham G., of Stanhope, Bart., M.P.
1841 Maxwell, Sir W., of Cardoness, Bart.
1862 Mackenzie, Sir Alexander Muir, of Delvine, Bart.
1854 Marjoribanks, Sir John, of Lees, Bart.
1855 Marjoribanks, Sir Dudley Coutts, of Guisachan, Bart.
1847 Maitland, Sir Alex. C. R. Gibson, of Barnton, Bart., M.P.
1846 Mackenzie, Sir Evan, of Kilcoy, Bart.
1857 Menteth, Sir James Stuart, of Mansfield, Bart.
1843 Matheson, Sir J., of Lews, Bart.
1857 Macadam, John, Blairover, Drymen
1859 Macadam, Dr Stevenson, F.R.S.E., Edinburgh
1864 Macadam, Wm., Kepculloch, Balfron
1840 Macalister, A., of Loup and Torrisdale
1842 Macalister, Keith, of Glenbarr, Tarbert
1855 M'Alister, Robt., Mid Ascog, Rothesay
1854 Macandrew, D. M., 17 Regent Terrace, Edinburgh
1862 M'Arthur, John, Banker, Inverary
1840 Macarthur, Major Alexander
1842 Macarthur, Duncan, New Zealand
1819 Macarthur, Dr Peter, Australia
1840 Macaskill, Donald, of Rhudunan, New Zealand
1853 M'Auslin, J., Kilbridbeg, Cairndow
1854 MacBey, Peter, Land-Surveyor, Elgin
1865 M'Bean, D., Auchterblair, Carr Bridge
1865 Macbean, David, of Dalmany, Nairnside, Nairn
1863 Macbraire, James, of Broadmeadows, Berwick
1868 M'Bride, J. Adam, M.R.C.V.S., Edin.
1868 M'Call, Professor J., Veterinary College, Glasgow
1846 M'Call, Henry, of Daldowie, Glasgow
1847 M'Call, Samuel, of Caitloch, Moniaive
1838 M'Call, Thomas, Merchant, Glasgow
1842 M'Callum, George Kellie, of Braco, Perthshire
1843 M'Callum, J., Plewlands, Lothian Burn
1861 M'Callum, John, Hosh Distillery, Crieff
1864 M'Callum, John, Fendoch, Crieff
1859 M'Candlish, Jn. M'Gregor, W.S., Edinburgh
1851 M'Caw, Alex., Ardlochan, Kirkoswald
1857 M'Chlery, Henry, London
1851 M'Clean, Alex. H., Auchneel, Stranraer
1843 M'Coll, Donald, Appin House, Appin

Admitted
1840 M'Combie, J. Boyn, Advocate, Aberdeen
1858 M'Combie, Peter, Farmton of Linturk, Alford
1858 M'Combie, Robt., Mains of Drumtochty, Auchinblae
1840 M'Combie, W., of Easter Skene, Skene
1847 M'Combie, William, M.P., Tillyfour, Aberdeen
1857 M'Connachy, Archibald, Mackremore, Campbeltown
1858 M'Connach, Chas., Cairnballoch, Alford, Aberdeen
1864 M'Connach, Hugh, Crobhlar, Alford, Aberdeen
1868 M'Connel, Frederic, of Bobgill, Kirtle Lodge, Trinity
1842 M'Connel, John, Penrith
1856 M'Cowan, Robert, 87 St Vincent Street, Glasgow
1850 M'Craken, John, Drum, New Abbey, Dumfries
1860 M'Crie, J., Broughton Mains, Garlieston
1863 M'Creath, Thos., Grain-Merchant, Ayr
1859 M'Culloch, Alexander, of Glen, Gatehouse of Fleet
1849 M'Culloch, Walter, of Ardwell, Gatehouse of Fleet
1858 M'Diarmid, Chas. A., Rockwood, Killin
1858 M'Diarmid, D. A., Killiemore, Aros
1867 M'Dairmid, H., Auchinree, Blair Athole
1838 Macdonald, Dr Alex., Prince Edward's Island
1841 Macdonald, Alexander, Inverness
1854 Macdonald, A., Balranald, Lochmaddy
1857 Macdonald, Alexander, jun., Strathmashie, Kingussie
1857 Macdonald, A., Runnagour, Aberfoyle
1855 Macdonald, A. S., Cyderhall, Dornoch
1841 Macdonald, Alister M'Ian, of Dalchosnie, Pitlochrie
1857 Macdonald, Angus, Banker, Callander
1827 Macdonald, Angus, of Glenaladale, Fort-William
1868 MacDonald, A., Land-Surveyor, Perth
1838 Macdonald, Archibald, Islay
1822 Macdonald, Major Donald, of Ardmore
1817 Macdonald, Captain Donald, of Isauld, Thurso
1860 Macdonald, D., the Hotel, Blair Athole
1868 M'Donald, Donald, Culcraggie, Alness
1865 Macdonald, D. P., Government Farm, Fort-William
1857 Macdonald, Harry, Banker, Portree
1830 Macdonald, Hugh P., late of Mongstad, Skye
1857 Macdonald, John, of Monachyle, Lochearnhead
4841 Macdonald, J., Robertson, Rodil, Harris
1861 Macdonald, Peter, Brodick, Arran
1868 Macdonald, R., Cluny Castle, Aberdeen
1807 Macdonald, Reginald G., of Clanranald
1839 Macdonald, Roderick C., of Castle Teirim

Admitted
1818 Macdonald, Professor Wm., M.D., St Andrews
1861 Macdonald, Wm., of Balnakilly, Blairgowrie
1860 Macdonald, William S., Fairyknowe, Ecclefechan
1865 Macdonald, William, Writer, Elgin
1844 Macdonald, Wm. Macdonald, of St Martin's, Perth
1846 Macdonnell, Eneas Ranald, of Morar, Edinburgh
1838 Macdouall, Col. J., of Logan, Stranraer
1865 M'Douall, Jas., yr. of Logan, Stranraer
1847 M'Dougal, Alex., Granton Mains, Edin.
1868 M'Dougal, George, Blythe, Lauder
1856 M'Dougall, Thos., Eskmills, Penicuik
1829 Macdougall, Allan, W.S.
1860 M'Dougall, Archibald, Miltown, Ardtalanaig, Kenmore
1865 M'Dougall, James, Lylestone, Lauder
1838 Macdougall, Captain James Patrick
1853 Macdougall, Jn., Kerrytonlia, Rothesay
1846 Macdowall, Major-Gen., of Garthland, Lochwinnoch
1845 Macdowall, H., Carruith, Bridge of Weir
1859 MacDuff, James, Newmill, Stanley
1834 Macewan, J., of Tar of Ruskie, Callander
1846 M'Ewan, Alexander, late of Sunderland
1858 M'Ewan, Andw., South Glen, Dalbeattie
1850 M'Ewan, John, Merchant, Glasgow
1864 M'Ewen, J., Beannie, Braco, Perthshire
1865 M'Ewen, John, Merchant, Stirling
1865 MacEwen, Jn. C., Moy Hall, Inverness
1859 MacEwen, Neil M., Hill o' Drip, Stirling
1851 M'Farlan, John, Faslane, Helensburgh
1857 Macfarlane, Alex., Pollanilline, Campbeltown
1857 Macfarlane, Donald, Achray, Aberfoyle
1860 Macfarlane, Donald, Balmuldy, Bishopbriggs
1857 Macfarlane, Duncan, Torr, Row
1861 Macfarlane, James, Shielhill, Stanley
1857 Macfarlane, John, of Ballencleroch, Lennoxtown
1857 Macfarlane, J., Greenfield, Helensburgh
1868 Macfarlane, Malcolm, Bridge of Tilt, Blair Athole
1862 Macfie, C., of Gogarburn, Corstorphine
1865 Macfie, David J., of Kilmux, Kennoway
1864 Macfie, Robert Andrew, of Dreghorn, M.P., Neston, Chester
1860 Macfie, Samuel, Aldermanhill, Dumfries
1865 M'Gavin, Robert, of Ballumbie, Dundee
1863 M'Gibbon, David, Inveravon, Polmont
1863 M'Gibbon, David, Architect, Edinburgh
1867 M'Gillewie, D., Central Bank, Pitlochrie
1850 M'Gill, J., Torrorie, Kirkbean, Dumfries
1860 M'Gill, James, Rotchell, Dumfries
1850 M'Gill, John, Barsalloch, Wigtown
1837 Macgregor, Alexander, London
1857 Macgregor, Donald R., Merchant, Leith
1833 Macgregor, James, Fort-William

Admitted
1832 Macgregor, John, late of Glengyle
1857 Macgregor, James, of Glengyle, Glasgow
1865 M'Gregor, James, Balmenoch, Cromdale
1859 M'Gregor, John, Bellridding, Dumfries
1861 M'Gregor, John, Ladywell, Dunkeld
1868 MacGregor, R., Wine Merchant, Perth
1865 Macgregor, Thos., Ord Distillery, Beauly
1835 M'Illraith, James, of Auchenflower, Ballantrae
1864 MacIndoe, Robert, Merkins, Dumbarton
1831 M'Inroy, Jas. P., of Lude, Blair-Athole
1827 M'Inroy, Lieut.-Colonel William, of The Burn, Brechin
1864 M'Intosh, David, of Havering Park, Romford
1852 M'Intosh, Lieut.-Gen., of Campsie, K.H.
1865 M'Innes, Duncan, of Cowden, Comrie
1861 MacIntyre, Donald, Tighnablair, Comrie
1844 Macintyre, J., Lochvoil Cottage, Oban
1857 M'Isaac, John, Dunglass, Campbeltown
1850 M'Iver. Evander, Scourie
1827 Macivor, John, New South Wales
1851 Mack, James, Upper-Keith, Blackshiels
1854 Mack, William, of Berrybank, Reston
1852 Mackay, Donald, Lythmore, Thurso
1846 Mackay, George, of Bighouse
1857 Mackay, John, Soccoth, Dalmally
1857 Mackay, John Alexander, of Blackcastle, Edinburgh
1869 Mackay, Peter, Kilbride, Lochgilphead
1857 M'Kean, Robt., Lumloch, Bishopbriggs
1855 M'Kechnie, Neil, Inverary
1864 Mackechnie, Jas., Torran, Lochgilphead
1869 Mackechnie, James, jun., Torran, Lochgilphead
1853 Mackenzie, Alexander, Banker, Elgin
1865 Mackenzie, Alexander, Writer, Forres
1846 Mackenzie, A., 19 Charlotte Sq., Edin.
1869 Mackenzie, Alexander Kincaid, of Ravelrig House, Currie
1855 Mackenzie, Capt. Boyce, Creech, Bonar
1844 Mackenzie, Daniel, jun., Merchant, Glasgow
1848 Mackenzie, Donald, Sheriff of Fifeshire
1855 Mackenzie, Don., Balnabeen, Dingwall
1858 Mackenzie, Donald, Bellevue, Beauly
1862 Mackenzie, G. A., Merchant, Liverpool
1860 Mackenzie, H., of Dundonnell, Ullapool
1845 Mackenzie, James, W.S., Edinburgh
1865 Mackenzie, James Fowler, of Allangrange, Munlochy
1868 Mackenzie, Captain James Dixon, of Findon, Dingwall
1835 Mackenzie, Jn., of Glack, Old Meldrum
1848 Mackenzie, John, Edinburgh
1853 Mackenzie, John Munro, Garrion Tower, Wishaw
1869 Mackenzie, John, Barnhill, Dumfries
1848 Mackenzie, John Ord, of Dolphinton, W.S., Edinburgh
1821 Mackenzie, John Whitefoord, W.S., Edinburgh

Admitted
1865 Mackenzie, John, Duchlage, Craigrownie, Roseneath
1846 Mackenzie, K. W. Stewart, of Seaforth, Brahan Castle, Dingwall
1848 Mackenzie, Kenneth, C.A., Auditor of Accounts to the Society
1853 Mackenzie, Murdo, Easter Moy, Beauly
1838 Mackenzie, Robert D., of Culdarvan, Alexandria
1856 Mackenzie, R., Glack, Old Meldrum
1865 Mackenzie, Roderick G., of Flowerburn, Fortrose
1846 Mackenzie, Thomas, of Ord, Beauly
1851 Mackenzie, Thomas, Edinburgh
1852 Mackenzie, Wm., Unthank, Inchture
1862 Mackenzie, Wm., Ardross, Alness
1860 M'Kerchar, J., Dalchiarlich, Fortingall
1857 M'Kerral, A., Brunerican, Campbeltown
1862 Mackerrow, A., Beansburn, Kilmarnock
1865 Mackessack, J., Earnside, Alves, Forres
1865 M'Kessack, Charles, Culblair, Ardersier
1857 M'Kessack, John, Balnaferry, Forres
1864 M'Kessack, Robert, of Waterford, Forres
1860 Mackie, George, of Dunjarg, Castle-Douglas
1862 Mackie, Ivie, of Auchencairn, Castle-Douglas
1864 Mackie, Jas., Logan, Lagavulin, Islay
1860 Mackie, John, Sarkshields, Kirkpatrick-Fleming, Ecclefechan
1852 Mackie, J. W., 108 Princes St., Edin.
1857 Mackie, Robert, Loudon, Galston
1854 Mackinlay, James, Glasgow
1818 Mackinlay, John, Whitehaven
1869 M'Kinlay, John, Hardhill, Bathgate
1860 Mackinnell, J. B. A., Palmerston Iron Works, Dumfries
1827 Mackinnon, Alexander Kenneth, Corry, Broadford
1869 M'Kinnon, Lachlan, jun., Advocate, Aberdeen
1811 Mackinnon, William Alexander, of Mackinnon, London
1865 Mackintosh, C. F., Solicitor, Inverness
1839 Mackintosh, Æneas, of Daviot, Inverness
1846 Mackintosh, Æneas, of Balnespeck, Inverness
1844 Mackintosh, Æneas W., of Raigmore, M.P., Inverness
1844 Mackintosh, A., of Holm, Inverness
1868 Mackintosh, C. H., of Dalmunzie, Perthshire
1832 Mackintosh, George, of Geddes, Nairn
1846 Mackintosh, Geo. Gordon, Balnespeck, Inverness
1851 Mackintosh, James, of La Mancha, Leadburn
1854 Mackintosh, R. T., Seedsman, Edin.
1850 M'Kirdy, John Gregory, of Birkwood, Lesmahagow
1860 M'Knight, Alexander, London

Admitted
1850 Maclachlan, Alex., Easter Longhaugh, Bishopton
1843 Maclachlan, George, W.S., Edinburgh
1817 Maclachlan, Robert, of Maclachlan
1862 Maclachlan, W. A., of Auchentroig, Balfron
1853 Maclagan, D., M.D., Prof. of Medical Jurisprudence, University of Edin.
1847 Maclagan, Peter, Beechwood, Dunkeld
1847 M'Lagan, Peter, of Pumpherston, M.P., Mid-Calder
1847 Maclaine, Hugh, Glenrisdell, Whitehouse
1855 Maclanachan, Jas., Van Diemen's Land
1859 Maclaren, D., Corrychrone, Callander
1853 Maclaren, Duncan, M.P., Newington House, Edinburgh
1858 Maclaren, D. S., Banker, Fort-William
1839 Maclaren, Dr John, Blairgowrie
1864 M'Laren, J., Gogar Park, Corstorphine
1859 M'Laren, J., late Monzie, Blair Athole
1858 M'Laren, John, Millhill, Inchture
1859 M'Laren, John, Dundee
1859 M'Laren, Joseph, late Greenhead of Arnot, Kinross
1858 M'Laurin, James, Greenhill, Dalbeattie
1856 Maclean, Alexander, of Ardgour, Bonaw
1835 Maclean, Alexander, of Carsaig, Aros
1835 Maclean, Colonel Allan Thomas
1837 Maclean, Archibald D., London
1838 Maclean, Colin, of Lagan, Islay
1822 Maclean, Donald, of Boreray
1861 Maclean, Duncan, Bellnollow, Crieff
1849 Maclean, George, late Hynish, Tyree
1854 Maclean, Hector Frederick, W.S., Edin.
1857 M'Lean, Jas., St Martins, Invergordon
1860 Maclean, J., Clerk of Supply, Wigtown
1869 M'Lean, Jas., Kilmartin, Lochgilphead
1860 M'Lean, Lauchlan, Pitilie, Aberfeldy
1823 Maclean, Dr Lachlan, Oban
1837 Maclean, N., Land-Surveyor, Inverness
1838 Maclean, W., of Plantation, Glasgow
1846 Macleay, Alex. D., Conservative Club, London
1839 Macleay, Kenneth, 16 Grosvenor Street, London
1857 Maclellan, T., North Balfern, Kirkinner
1865 MacLennan, Alexander F., Meikle Urchany, Nairn
1865 MacLennan, Donald, junior, Muirton, Munlochy
1865 Maclennan, A., Ord Distillery, Beauly
1840 Maclennan, John, late of Lyndale
1864 MacLennan, John, Carnock, Strathconon, Beauly
1830 Macleod, Donald, Coulmore, Inverness
1841 Macleod, Donald, Claggan, Dunvegan
1849 Macleod, John N., Banker, Kirkcaldy
1839 Macleod, Norman, of Dalvey, Forres
1839 Macleod, Norman, of Macleod, London
1854 Macleod, R. B. Æneas, of Cadboll, Invergordon Castle Invergordon

Admitted
1865 M'Leod, W. A., Scorrybreck, Portree
1860 M'Millan, John, Castramont, Gatehouse
1861 M'Millan, J. G., of Ballinakill, Clachan
1854 M'Minn, F., 1 Graham Street, Edin.
1854 M'Murtrie, John, Banker, Ayr
1865 M'Nab, Alexander, of Techmuiry, Glenochil, Stirling
1837 Macnab, J. Monro, late of Arthurstone
1855 Macnaghten, Steuart, of Inver Trossachs, Callander
1857 M'Nair, James, Smerly, Campbeltown
1857 MacNair, John, 33 Moray Place, Edin.
1857 M'Naughton, Alex., Remony, Kenmore
1859 M'Naughton, Alexander, Kerrowmore, Fortingall
1854 Macnaughton, J., of Smithfield, Ayr
1866 Macnaughton, Alexander, S.S.C., Edin.
1848 Macneale, H., of Ugadale, Campbeltown
1846 M'Neill, Archibald, P.C.S., Edinburgh
1868 M'Neill, Lt.-Colonel A. C., Oronsaig, Port Askaig
1861 M'Neill, Charles, Lossit, Ballygrant
1857 M'Neill, Robert, Letter, Killearn
1860 M'Neill, John Carstairs, of Gigha
1861 M'Neillie, W., of Castlehill, Dumfries
1859 M'Nie, William C., Stirling
1857 M'Niven, Alexander, Sheemore, Luss
1857 M'Onie, John, Auchmour, Drymen
1852 Maconochie, Robert Blair, W.S., Edinburgh
1857 M'Phail, Alexander, America
1841 Macpherson, Alexander, M.D., Lauriston Castle, Cramond
1865 Macpherson, Dun., Banker, Kingussie
1865 Macpherson, Col. D. E., of Belleville, Kingussie
1827 Macpherson, Ewan, of Cluny Macpherson, Kingussie
1864 Macpherson, Hugh, Slafarquhar, Denny
1856 Macpherson, James, Nuide, Kingussie
1865 Macpherson, James, Drumore, Croy, Ardersier
1856 Macpherson, John, Blantyre, Glasgow
1857 Macpherson, J., Lord Chamberlain's Office, London
1860 Macpherson, J., Killihuntly, Kingussie
1857 M'Queen, J., of Boquhapple, Thornhill Stirlingshire
1839 Macrae, Archibald, M.D., late Bruiach, Inverness-shire
1850 Macrae, Don., late Luskintyre, Harris
1863 Macrae, Donald, Banker, Kingussie
1865 Macrae, Capt. J. A., Vallay, Lochmaddy
1868 M'Rae, John, Balantian, Kingussie
1831 Macritchie, Thomas Elder, of Craigton, W.S., Edinburgh
1868 M'Robie, Peter, Sunnyside, Aberdeen
1861 M'Tavish, Alexander S., Killin
1857 M'Tavish, Duncan, America
1848 Mactier, Alexander Walker, of Durris, Aberdeen
1828 Macvicar, Rev. J. G., D.D., Moffat

Admitted
1839 Madden, Henry R., M.D., Brighton
1847 Main, Alexander James, Pollockshiels, Glasgow
1852 Maitland, George F., of Hermand, West Calder
1858 Maitland, James, jun., Little Methlic, Methlic
1860 Maitland, Rev. James, D.D., Kells, New Galloway
1867 Maitland, James Ramsay Gibson, yr. of Barnton
1865 Maitland, John, of Freuch, Balgreggan, Stranraer
1858 Maitland, William, Netherton, Insch
1841 Makgill, G., of Kemback, Cheltenham
1860 Malcolm, John, of Poltalloch, Lochgilphead
1864 Malcolm, John Wingfield, yr. of Poltalloch, M.P.
1840 Malcolm, W. E., of Burnfoot, Langholm
1861 Mangles, George, Givendale, Ripon, Yorkshire
1847 Mann, John, Glasgow
1856 Marjoribanks, John, Roseneath
1854 Marjoribanks, Wm., Warriston House, Edinburgh
1864 Marr, J. A., of Alderston, Mid-Calder
1855 Marr, Wm. Smith, Mill of Tillyhilt, Tarves
1866 Marshall, George Hunter, of Gartchonzie, Edinburgh
1868 Marshall, James (Marshall, Sons, & Co.), Gainsborough
1847 Marshall, John, Clebrig, Lairg
1854 Marshall, John, of Curriehill, Edin.
1867 Marshall, Peter, of Townhead, Kilsyth
1850 Marshall, Robert, Gateside, Kirkliston
1860 Marshall, Thomas, the Howes, Annan
1858 Martin, James, Flesher, Aberdeen
1858 Martin, John, Claggan, Kenmore
1865 Martin, John, 32 Rutland Street, Hampstead Road, London
1867 Martin, John M., yr. of Auchendennan, Alexandria
1859 Martin, Montague, J., Mansion House, Greenock
1854 Martin, Dr N., of Glendale, Dunvegan
1865 Martin, Sam. E., Seed-Merchant, Hull
1867 Martin, W. J. B., Killinochonoch, Lochgilphead
1859 Mason, R., of Bankton, Midcalder
1863 Mather, Daniel, Hallrule, Hawick
1846 Matheson, Alexander, of Ardross, M.P.
1847 Matheson, Major-General Thomas
1853 Mathews, N., Whitehills, Garliestown
1864 Mathie, James, Banker, Stirling
1861 Matthew, Alex., Forret, Cupar-Fife
1861 Maxwell, Edward Heron, of Teviotbank, Hawick
1844 Maxwell, Francis, Glasgow
1861 Maxwell, F., of Drumpark, Dumfries
1865 Maxwell, Francis, of Gribton, Dumfries

Admitted
1867 Maxwell, Maxwell Hyslop, of Glengaber, Dumfries
1869 Maxwell, Gen. John Harley, of Portrack, Dumfries
1857 Maxwell, R., Bellochgair, Campbeltown
1869 Maxwell, Robert, of Breoch, Terregles Bank, Dumfries
1839 Maxwell, Wellwood H., of Munches, M.P., Dalbeattie
1839 May, George, Civil Engineer, Inverness
1852 Meall, J., Buttergask, Coupar-Angus
1859 Mears, Wm., Commission Agent, Edin.
1857 Meiklam, John, of Gladswood, Melrose
1854 Meikle, David, late Clunie Mains, Kinglassie
1858 Meikle, James, Nether Mains, Kilwinning
1854 Meikle, J., Blackburn Hall, Bathgate
1867 Meikle, John, Seafield, Bathgate
1862 Meiklejon, John, Foundry, Dalkeith
1864 Mein, Alexander, Bank of Scotland, Fraserburgh
1861 Mein, Andrew Whytock, of Hunthill, Jedburgh
1863 Mein, Benj., Roxburgh Barns, Kelso
1860 Mein, N. A., Marsh House, Canonbie
1838 Mein, Robert, Factor to the Duke of Bedford
1863 Mein, William, Seedsman, Kelso
1857 Meldrum, D., of Craigfoodie, Cupar-Fife
1863 Meldrum, Edward, Chemical Works, Bathgate
1860 Meldrum, James, Ayton, Newburgh
1869 Meldrum, J., of Eden Bank, Cupar-Fife
1869 Meldrum R., of Pittormie, Cupar-Fife
1854 Melrose, J., Newbigging, Coldstream
1848 Melville, Jas. Moncrieff, W.S., Edin.
1819 Melville, J. W., of Bennochy, St Andrews
1862 Melvin, Charles, Penston, Tranent
1849 Melvin, James, Bonnington, Ratho
1857 Menzies, A., of Balornock, Glasgow
1865 Menzies, Donald, Carr Bridge
1863 Menzies, Duncan, 13 Young St., Edin.
1864 Menzies, Duncan, Auchingarin, Luss
1841 Menzies, Fletcher Norton, Edinburgh, Secretary of the Society
1853 Menzies, Graham, London
1857 Menzies, James, Auch, Tyndrum
1849 Menzies, J. A. Robertson, New Zealand
1842 Menzies, R. S., of Culdares, Cardney, Dunkeld
1865 Menzies, William Auch, Tyndrum
1861 Mercer, Daniel, Achamore, Dunoon
1850 Mercer, Græme R., of Gorthy, Perth
1861 Mercer, John, Ardnadam, Dunoon
1853 Mercer, Major, of Huntingtower, Perth
1863 Mercer, R., of Scotsbank, Ramsay Lodge, Portobello
1838 Merry, J., of Belladrum, M.P., Beauly
1865 Methven, Thos., Nurseryman, Edin.
1867 Michie, Christopher Y., Cullen House, Cullen

Admitted
1840 Middleton, C. S., Merchant, Liverpool
1864 Middleton, George, Cornton, Ferintosh, Dingwall
1863 Middleton, John, Edinburgh
1864 Middleton, Robt., Sciennes, Edinburgh
1858 Middleton, Wm., Bridgefoot, Monymusk
1839 Mill, James, Surgeon, Thurso
1861 Mill, Robt., Overseer, Balgowan, Perth
1853 Millar, C. H., Merchant, Montrose
1852 Millar, James Lawson, Waulkmill, Dunfermline
1864 Millar, James, Mills of Torr, Blair-Drummond
1848 Millar, John, of Sheardale, 13 York Place, Edinburgh
1853 Millar, Thos., West Briggs, Kirkliston
1854 Millar, Thomas, of Balliliesk, Muckart
1843 Miller, Captain Alexander Penrose
1868 Miller, G. J., of Frankfield, Glasgow
1861 Miller, George, St Magdalenes, Perth
1853 Miller, Hew, Ochtertyre, Crieff
1847 Miller, John, of Leithen, M.P., Edin.
1861 Miller, John, Dounreay, Thurso
1843 Miller, O. G., Dundee
1864 Miller, William, of Manderston, Leith
1855 Milligan, James, Hayfield, Thornhill
1857 Mills, George, Greenend, St Boswells
1859 Mills, G., Horsburgh Castle, Peebles
1863 Mills, T., Horsburgh Castle, Peebles
1858 Milne, A., Corse of Kinnoir, Huntly
1855 Milne, Alex., Mill of Allathan, Udny
1851 Milne, George, of Kinaldie, Aberdeen
1856 Milne, J., Netherton, Fraserburgh
1856 Milne, J., Pitsligo Castle, Rosehearty
1857 Milne, James, Balnagubs, Netherley, Stonehaven
1859 Milne, Jas., late Meinfoot, Ecclefechan
1862 Milne, James, Cairnhill, Huntly
1867 Milne, John, Mains of Laithers, Turriff
1841 Milne, Nicol, of Faldonside, Melrose
1863 Milne, Nicol, Dryhope, Selkirk
1861 Milne, Peter, 19 Buccleuch Pl., Edin.
1866 Milne, W., Tillycairn, Cluny, Aberdeen
1851 Mitchell, Alex., of Sauchrie, Maybole
1857 Mitchell, Alexander, Alloa
1863 Mitchell, Alexander, of Stow, Carolside, Earlston
1848 Mitchell, Andrew, Alloa
1861 Mitchell, David, Burnton, Laurencekirk
1857 Mitchell, Duncan, Blairvockie, Luss
1866 Mitchell, D. F., of Thainstone, Kintore
1865 Mitchell, G., Meikle Haddo, Foveran
1848 Mitchell, H., of Polmood, 12 Broughton Place, Edinburgh
1857 Mitchell, Hugh, Balligreggan, Campbeltown
1851 Mitchell, James, Auchenraith, Kirkmahoe, Dumfries
1857 Mitchell, J., Homeston, Campbeltown
1855 Mitchell, J. P., Traprain, Prestonkirk
1864 Mitchell, James, Banker, Pitlochrie
1850 Mitchell, J., Ballemenach, Campbeltown

Admitted
1861 Mitchell, John, Flisk Mill, Newburgh
1862 Mitchell, J., Lordscairnie, Cupar-Fife
1864 Mitchell, John, Banker, Dingwall
1836 Mitchell. J., Civil Engineer, Inverness
1852 Mitchell, Robert, Cadham, Markinch
1859 Mitchell, Robert, Skelpie, Pitlessie
1850 Mitchell, S., Dalivaddy, Campbeltown
1862 Mitchell, William, Merchant, Montrose
1849 Mitchell, W. G., of Carwood, Biggar
1863 Mitchell, Wm., Ribigill, Tongue, Lairg
1868 Mitchell, William, Auchnagathel, Keig, Aberdeen
1832 Mitchelson, Archibald, Hepburne, Old Faskally, Blair Athole
1861 Moffat, George, Minard, Inverary
1850 Moffat, James, Garwald, Langholm
1860 Moffat, James, Gateside, Kirkconnel, Sanquhar
1867 Moffat, James, British Linen Bank, Castle Douglas
1850 Moffat, John, Craik, Hawick
1862 Moffat, Thomas, Drumbuie, Sanquhar
1863 Moffat, W., Procurator-Fiscal, Dingwall
1864 Moffat, William, Shirva, Kirkintilloch
1864 Moffat, Wm., Easter Kinleith, Currie
1864 Moir, Benjamin, Merchant, Aberdeen
1858 Moir, James, Mains of Wardhouse, Insch
1869 Moir, James, Moulinvadie, Pitlochrie
1834 Moir, John M., of Hillfoot and Milton, Dollar
1851 Moir, Robert, of Easterton, Tarty, Ellon
1842 Moncrieff, Alexander, W.S., Perth
1852 Moncrieff, Alex., of Barnhill, Perth
1866 Moncrieff, David Scott, W.S., Edin.
1848 Moncreiff, Right Hon. James, Lord-Advocate, Q.C., M.P.
1831 Moncrieff, R. S., of Fossoway, Dalkeith
1833 Monro, A. B., of Auchinbowie, Stirling
1851 Monro, David, of Allan, Tain
1846 Monteith, B., Liberton Tower, Edin.
1866 Monteith, D., Belleville Lodge, Edin.
1837 Monteith, Robert, of Carstairs
1846 Montgomery, John H., of Newton
1839 Moore, John C., of Corsewall, Stranraer
1852 Moray, Chas. H. D., Abercairny, Crieff
1868 Morgan, David, South Main of Ethie, Arbroath
1869 Moray, H. D., yr. of Abercairny, Crieff
1850 Morison, Alexander, of Bognie, Mountblairy House, Turriff
1861 Morison, James, Rossie, Dunning
1850 Morison, James G., Glasgow
1862 Morison, J. B. B., of Finderley, Kinross
1855 Morrison, Charles, of Islay, Bowmore
1858 Morrison, Harry L. L., Guise, Whitehouse, Aberdeen
1850 Morrison, James, Glasgow
1864 Morrison, James, of Livilands, Stirling
1859 Morrison, John, West Dalmeny, South Queensferry
1861 Morrison, William, Cairnie, Forteviot
1835 Morton, H., Belvidere House, Trinity

Admitted
1857 Morton, James, Backbraes, Whithorn
1861 Morton, J., Lambieletham, St Andrews
1861 Morton, John, North Muirton, Perth
1859 Mosman, H., of Auchtyfardle, Lanark
1864 Mossman, Adam, Blacket Place, Edin.
1843 Moubray, John M., late of Hartwood
1862 Moubray, Robert, Cambus Distillery, Stirling
1865 Mounsey, J. T., of Kingfield, Longtown, Cumberland
1867 Muckart, James, Land Steward, Culzean, Maybole
1840 Mudie, John, of Pitmuies, Forfar
1852 Muir, G. W., Caberston, Innerleithen
1864 Muir, James, Hardington Mains, Wiston, Biggar
1843 Muir, John, late of Gartferrie
1859 Muir, John, Lochfergus, Kirkcudbright
1863 Muir, W. H., S.S.C., Edinburgh
1820 Muirhead, Claud, Edinburgh
1862 Muirhead, E. W., late Lethendy, Scone
1863 Muirhead, George, Durdie, Errol
1865 Muirhead, J. J., 54 Princes St., Edin.
1865 Muirhead, John, Salton Mains, Tranent
1867 Muirhead, Robert, Chesterhall, Biggar
1858 Mundell, D., Heath Cottage, Inverness
1864 Munro, A., Balintraid, Invergordon
1857 Munro, Donald, Stornoway
1864 Munro, D., Conchra, Contin, Dingwall
1853 Munro, John, Fairnington, Kelso
1854 Murdoch, James, Carntyne, Shettleston
1853 Murdoch, John Burn, of Gartincaber, Advocate
1839 Murdoch, Peter, of Langbank, Newton-Mearns
1857 Murdoch, Robert, Hallside, Cambuslang
1864 Murdoch, Thomas, Westwood, Blair-Drummond
1856 Murdoch, William, Writer, Huntly
1831 Mure, Lt.-Col. Wm. of Caldwell, Beith
1841 Mure, William, Kirkcudbright
1846 Murray, Andrew, of Oonland
1828 Murray, Anth., of Dollerie, W.S., Edin.
1864 Murray, D., 31 Queen Street, Edinburgh
1860 Murray, Rev. George, of Torquhain, New Galloway
1854 Murray, George, New Zealand
1865 Murray, G. R., Chapel Rossan, Stranraer
1867 Murray, G., Elvaston Castle, Derby
1843 Murray, Jack H., Captain R.N., Easthaugh, Pitlochrie
1850 Murray, James, East Barns, Dunbar
1857 Murray, James, Dumfries Arms Hotel, Old Cumnock
1861 Murray, James, Strathleven, Dumbarton
1869 Murray, James Wolffe, of Cringletie, Peebles
1860 Murray, J., Grougar Mains, Kilmarnock
1862 Murray, John L., of Heavyside, Biggar
1863 Murray, Lieut.-Col. John, of Polmaise, Stirling
1863 Murray, Dr John, Kersknow, Kelso

Admitted
1863 Murray, John, of Wooplaw, Galashiels
1820 Murray, Joseph, of Ayton
1851 Murray, Kenneth, of Geanies, Tain
1850 Murray, Robert, Spittal, Penicuik
1858 Murray, R., 7 Roxburgh Place, Edin.
1857 Murray, Thomas, Eastside, Penicuik
1852 Murray, Thomas G., W.S., Edinburgh
1854 Murray, Walter, 4 West Lauriston Place
1856 Murray, William, Kilcoy, Inverness
1858 Murray, William, Mains of Pittendreigh, Turriff
1859 Murrie, John, Stirling
1859 Mustard, Alex., Davo Mains, Fordoun
1857 Mutter, J., Wester Melville, Lasswade
1858 Myers, Geo. C., Town-Clerk, Montrose
1860 Mylne, Thos., Niddrie Mains, Liberton
1865 Myles, James, Deanside, Renfrew

1843 Northesk, Right Hon. the Earl of
1843 Napier, Right Hon. Lord, K.T.
1863 Napier, Hon. William
1846 Neaves, Hon. Lord
1848 Napier, Sir R. J. M., of Milliken, Bart.
1865 Nepean, Sir Molyneux Hyde, of Loders Court, Bart
1857 Napier, Dugald, Australia
1840 Napier, George, Advocate, Sheriff of Peeblesshire
1844 Napier, R., of Shandon, Helensburgh
1839 Nasmyth, Robt., 5 Charlotte Sq., Edin.
1868 Naumann, C. O., Chancellor of the Imperial Royal Austrian Consulate, Edin.
1864 Neilson, James, Rose Hall, Falkirk
1867 Neilson, William, Woodhall, Holytown
1859 Nelson, Michael, Gallamuir, Stirling
1845 Newall, John, Mexico
1838 Newton, James Ewan, Linnbank House, Lanark
1865 Newton, Captain Hay, of Newton, Haddington
1837 Newton, Robert P., of Castlandhill, Polmont Bank, Falkirk
1864 Nicholson, Alex., Writer, Cupar-Fife
1861 Nicholson, Robert, Lochbank, Dumfries
1853 Nicol, James Dyce, of Ballogie, M.P., Aberdeen
1867 Nicol, Alex., Lord Provost of Aberdeen
1844 Nicoll, Alexander, late of Edinburgh
1867 Nicoll, T. Munro, Littleton of Lindertis, Kirriemuir
1819 Nicolson, Major Allan M., of Ardmore
1857 Nicolson, J. Badenach, yr. of Glenbervie, Fordoun
1857 Nicolson, Neil, Ardlamont, Greenock
1843 Nielson, A., Bank of Scotland, Glasgow
1852 Nimmo, Matt., Foot of Green, Stirling
1854 Nisbet, John, Rumbleton, Greenlaw, Dunse
1865 Nisbet, Ralph P., Estate Office, Thorney, Peterborough
1847 Nisbett, J. M., of Cairnhill, Drum, Edin.
1860 Niven, Alexander T., C.A., Edinburgh

Admitted
1852 Nivison, Thomas, Burn, Thornhill
1865 Nixon, William, of Lynnwood, Hawick
1862 Norie, Henry Hay, W.S., Perth
1860 Norman, William, Oughterside, Carlisle
1861 Norman, James, of Whitehill, Dysart
1867 Norris, Peter, Todholes, Fintry, Stirling

1867 Oranmore and Brown, Right Hon. Lord
1823 Ogilvy, Hon. William, of Loyal, Forfar
1862 Ogilvy, Hon. W. B.
1854 Ormidale, Hon. Lord
1824 Ogilvy, Sir John, of Inverquharity, Bart., M.P.
1830 Orde, Sir John Powlett, of Kilmory, Bart.
1868 Ochterlony, Sir Charles Metcalfe, of Ochterlony, Bart.
1844 Orr, Sir A., of Harviestoun, Glasgow
1859 Odams, James, London
1854 Ogilvie, Archibald, Old Liston, Ratho
1868 Ogilvie, David, Kirkton, Arbroath
1820 Ogilvie, Captain William, R.N.
1809 Ogilvie, William, of Chesters, Jedburgh
1853 Ogilvie, William, Broadhaugh, Hawick
1860 Ogilvie, George, Holefield, Kelso
1868 Ogilvy, Donald, of Clova, Balnaboth
1836 Ogilvy, John, of Inshewan, Forfar
1859 Ogilvy, John, Harecraig, Dundee
1826 Ogilvie, Peter Wedderburn, of Ruthven, Meigle
1844 Ogilvy, Thomas, yr. of Ruthven, Meigle
1838 Ogilvy, Thos., of Corrimony, Inverness
1840 Ogston, Alexander, of Ardoe, Aberdeen
1850 Oliver, James, Howpasley, Hawick
1852 Oliver, James, Bridge House, Hawick
1853 Oliver, Robert, of Blakelaw, Kelso
1856 Oliver, Thomas, of Redheughs, Corstorphine
1858 Oliver, W. Elliot, Glenforsa, Mull
1863 Oliver, William, of Langraw, Bonchester Bridge
1841 Ord, John, of Muirhouselaw, Nisbet, Kelso
1858 Orde, John W. Powlett, yr. of Kilmory
1848 Ormiston, William T., of Glenburn Hall, Jedburgh
1869 Osburn, Robert, Hitchell, Annan
1848 Oswald, James Townsend, of Dunnikier, Kirkcaldy
1863 Otto, William E., Monteviot, Jedburgh
1851 Ovens, Thomas, Merchant, Galashiels

1869 Perth, Right Hon. the Earl of
1863 Polwarth, Right Hon. Lord
1843 Patton, Right Hon. George, of Cairnies, Lord Justice-Clerk
1810 Pringle, Sir John, of Newhall, Bart.
1852 Pagan, Allan Cunningham, Invergeldie, Comrie
1845 Pagan, Wm., of Clayton, Cupar-Fife
1863 Park, Alexander B., Woodend, Kelso
1859 Park, J., late Cliftonhall Mains, Ratho

Admitted
1863 Park, James, Stoneyhill, Musselburgh
1854 Park, Thos., Stoneyhill, Musselburgh
1866 Park, Thomas B., Haddington
1857 Parker, J., Nether Broomlands, Irvine
1867 Parnell, Dr Richd., Gattonside, Melrose
1857 Pate, T., South Draffan, Lesmahagow
1853 Paterson, A., Mains of Mulben, Keith
1860 Paterson, Alex., Carmacoup, Douglas
1848 Paterson, Arch., Meadowfield, Corstorphine
1867 Paterson, Charles, Camserney Cottage, Aberfeldy
1857 Paterson, David, late of Cattadale, Campbeltown
1854 Paterson, D. A., Merchant, Leith
1853 Paterson, James, Whitehouse, Lamlash
1860 Paterson, Jas., of Longbedholm, Moffat
1862 Paterson, James, Chapelhill, Hawick
1862 Paterson, Jas. E., Linlathen, Broughty-Ferry
1847 Paterson, John, jun., late Killeonan Campbeltown
1852 Paterson, John, Macoriston, Doune
1857 Paterson, John, Skirling Mains, Biggar
1860 Paterson, John, Eastfield, Penicuik
1862 Paterson, John, Howcleuch, Moffat
1854 Paterson, J. W., Terrona, Langholm
1848 Paterson, Robert, of Birthwood, Biggar
1869 Paterson, Thomas, W.S., Edinburgh
1835 Paterson, R., of Brocklehirst, Dumfries
1851 Paterson, Walter, Merchant, Glasgow
1851 Paterson, William, Twiglees, Lockerbie
1863 Paterson, Wm., of Ettrickhall, Selkirk
1865 Paterson, Wm., Armadale, Melvich
1846 Patison, John, W.S., Edinburgh
1857 Paton, Alexander, Macnairston, Ayr
1864 Paton, D., Harrietfield, Logiealmond
1859 Paton, John, Balbedie, Lochgelly
1833 Paton, John, of Crailing, Jedburgh
1841 Paton, John, of Grandholm, Aberdeen
1865 Patrick, James, of Kilmun, Argyleshire
1850 Patterson, John, Middleton, Dollar
1851 Patterson, Robert, Stirling
1864 Pattison, A. D., of Dalmuir, Glasgow
1869 Pattison, George Handasyde, Advocate, Sheriff of Roxburgh and Selkirk
1861 Pattullo, G., Keillor, Coupar-Angus
1861 Pattullo, Peter, Eassie Farm, Glammis
1839 Paul, Rev. John, D.D., Edinburgh
1855 Paul, William, Advocate, Aberdeen
1855 Paul, William, Kinflat, Forres
1860 Payne, James, Carruchan, Dumfries
1857 Peake, John, Craigend, Stow
1854 Pearson, Andrew A., of Springfield, Carluke
1863 Pearson, David A., Johnston Lodge, Laurencekirk
1865 Peat, George, Banker, Dunse
1858 Peat, John, Manor, Stirling
1867 Peile, H. R. B., Catter House, Drymen
1864 Pelham, C. Thursby, Etteridge, Kingussie

Admitted
1857 Pender, George, Dumbreck, Kilsyth
1865 Pender, John Menzies, Auchindawe, Fort-William
1869 Pender, J., of Minard Castle, Inverary
1868 Pender, J., Springhill, Stane, Motherwell
1859 Penman, John, Bonally, Colinton
1863 Penny, Thomas, Bartlehill, Coldstream
1854 Peter, Charles, Canterland, Marykirk
1854 Peter, John, Croyard, Beauly
1862 Peter, John, of Over Possil, Glasgow
1849 Peter, Robert, Banker, Aberfeldy
1868 Petrie, James, Glencorrie, Dufftown
1856 Philip, George, Boynds, Keith Hall
1851 Philip, John, Polton Mains, Lasswade
1844 Philip, Robert, Leith
1858 Philip, W., Lofthillock, Keith Hall
1860 Phillips, Hugh, Cracrop, Stapleton, Carlisle
1854 Phillips, John, Laighpark, Milngavie
1862 Phillips, John Douglas, St Colme, Aberdour
1864 Philp, Robert, Bridge of Allan
1863 Phin, John, S.S.C., Edinburgh
1857 Picken, James, Laigh Langside, Craigie, Kilmarnock
1857 Picken, Jas. H., of Hillhouse Lodge, Fenwick
1857 Picken, John, Mansfield Mains, New Cumnock
1860 Picken, R., Barnkirk, Newton-Stewart
1863 Pierson, J. Alexander, of the Guynd, Arbroath
1855 Pirie, James, Orchardton, Udny
1868 Pirie, T., Kinmundy, Longside, Aberdeen
1841 Pitcairn, John, of Pitcullo, Cupar
1863 Pitcairn, John, Kinnaird, Newburgh
1861 Pitcairn, Wm., of Cunnoquhie, Ladybank
1859 Pitman, Frederick, W.S., Edinburgh
1858 Pittendrigh, Alexander, Glaslaw, New Pitsligo
1859 Pittendrigh, A., Mains of Park, Cortes
1857 Pittendrigh, J., Bodychell, Fraserburgh
1859 Playfair, Dr Lyon, C.B., M.P., Professor of Chemistry, University of Edinburgh
1859 Plenderleith, A., Moorfoot, Gorebridge
1842 Plummer, Charles Scott, of Sunderland Hall, Selkirk
1850 Plummer, G. Hay, Melville, Dalkeith
1860 Plummer, J., 35 Lauriston Place, Edinburgh
1841 Pollexfen, James R., of Cairston, W.S., Edinburgh
1844 Pollok, A., of Faside, Newton Mearns
1815 Pollok, Arthur, of Lochlibo, Broom, Newton Mearns
1852 Ponton, George, Woolston, Linlithgow
1867 Pople, H. W., British Hotel, Perth
1861 Pople, J. B., Birnam Hotel, Dunkeld

Admitted
1851 Porteous, A., of Lauriston, Montrose
1855 Porter, James, Factor, Monymusk, Aberdeen
1859 Porter, John Thos. Brown, Lincoln
1854 Pott, Gideon, of Knowsouth, Jedburgh
1867 Potter, James, of Glenfuir, Falkirk
1863 Potts, Andrew, Lewinshope, Selkirk
1868 Potts, Wm. H., Lagnaha, Ballachulish
1861 Powrie, Archibald, Lairwell, Perth
1849 Powrie, James, of Reswallie, Forfar
1855 Prentice, Geo., of Strathore, Kirkcaldy
1864 Prentice, George, yr. of Strathore, Newbigging, Burntisland
1865 Prentice, R. R., Skeddoway, Kirkcaldy
1855 Primrose, James, Turniedykes, Ford
1863 Primrose, James Thomson, Sauchland, Ford
1859 Pringle, Alex., of Whytbank, Selkirk
1863 Pringle, David, of Wilton Lodge, Hawick
1863 Pringle, David, Hyndlee, Bonchester Bridge
1863 Pringle, James Hall, of Dirrie, Cleethaugh, Jedburgh
1863 Pringle, James Thomas, of Torwoodlee, Selkirk
1863 Pringle, John, Agricultural Implement Agent, Edinburgh
1865 Pringle, John, Garvald, Gorebridge
1852 Pringle, Robert K., The Grove, Darly Dale, Matlock
1866 Pringle, Robert Oliphant, Dublin
1868 Profeit, Dr, Nether Towie, Inverkindie, Aberdeen
1848 Proudfoot, J., Pinkiehill, Musselburgh
1868 Proudfoot, T., Pinkiehill, Musselburgh
1864 Pullar, John, jun., Keirfield, Bridge of Allan
1865 Punton, F. H., West Fortune, Drem
1867 Purdie, Geo., Muirhouse, Carnwath
1856 Purdie, Thos., 77 George St., Edinburgh
1860 Purves, Andrew, Pressmenan, Stenton
1855 Purves, Charles, Lugton, Dalkeith
1861 Purves, James, Lochend, Thurso
1859 Purves, William, Burnfoot, Kelso
1844 Purvis, John, of Kinaldy, St Andrews
1851 Purvis, John, Glasgow

1869 QUEENSBERRY, Most Noble the Marquis of

1840 RICHMOND and LENNOX, His Grace Charles, Duke of, K.G.
1837*ROXBURGHE, His Grace James, Duke of, K.T.
1868 ROSEBERY, Right Hon. the Earl of
1857 ROSSLYN, Right Hon. the Earl of
1857 ROLLO, Right Hon. Lord
1823 RICHARDSON, Sir John Stewart, of Pitfour, Bart.
1868 RAMSAY, Sir George, of Banff, Bart., Alyth

Admitted
1845 Riddell, Sir T. M., of Sunart, Bart.
1820 Radcliffe, Sir Joseph, of Millsbridge, Bart.
1853 Russell, Sir Wm., of Charlton, Bart.
1862 Rae, Alexander, Invergowrie, Dundee
1860 Rae, William, Gateslack, Thornhill
1865 Raiker, James, Auchonochie Lodge, Dingwall
1867 Raines, Thos., Bridgehaugh, Stirling
1858 Rainy, Dr Alexander, Aberdeen
1846 Rainy, George, of Rasay, Broadford
1838 Rait, D. C., Goldsmith, Glasgow
1854 Rait, James, of Anniston, Arbroath
1868 Ralston, Andrew, Glamis, Forfar
1867 Ralston, Andrew, Lagg, Dunure, Ayr
1856 Ramsay, John, of Kildalton, Bowmore
1856 Ramsay, Major J., of Barra Straloch, Aberdeen
1841 Ramsay, Robert B. Wardlaw, of Whitehill, Lasswade
1861 Ramsay, Maj.-Gen. W. Maule, London
1864 Ramsay, Rear-Admiral Wm., C.B., Edinburgh.
1837 Ranken, George, Australia
1844 Ranken, Patrick, of Mavisbank, Airdrie
1838 Ranken, Thomas, S.S.C., Edinburgh
1836 Ranken, William, M.D., Glenlogan, Sorn
1866 Rankin, Geo., Union Bank, Aberfeldy
1857 Rankine, John, of Beoch, Lochlands, Maybole
1868 Rankine, R. W., Rosebank, Falkirk
1865 Rankine, J. W. Macquorn, LL.D., Professor of Engineering, University of Glasgow, Consulting Engineer to the Society
1859 Rannie, H. A., Mill of Boyndie, Banff
1859 Rannie, M. G., Edenmouth, Kelso
1837 Rashleigh, Wm., of Menabilly, Fowey
1868 Rate, George, Lampockwells, Tranent
1854 Rattray, Lieut.-Col. J. C., of Craighall, Blairgowrie
1856 Rawdin, Joseph, Chemist, Jedburgh
1854 Ray, William, Sunbank, Elgin
1863 Rea, Charles, Doddington, Wooler
1857 Redfern, W. Macquarrie, London
1847 Reed, Ellerington, Kilcalmkill, Golspie
1864 Reekie, A., Walton, Auchtertool, Fife
1857 Reid, Alexander, Cruivie, Cupar
1855 Reid, Ben. L., Balcairn, Old Meldrum
1844 Reid, Charles G., W.S.
1867 Reid, F. R., of Gallowflat, Rutherglen
1868 Reid, George, Seedsman, Aberdeen
1869 Reid, James, of Auchinellen, Kilmartin
1855 Reid, James, Ballencrieff, Drem
1857 Reid, James, Cattle Dealer, Biggar
1861 Reid, James, Donavourd, Dunkeld
1867 Reid, James R., Woodburn, Rutherglen
1869 Reid, J., Sanquhar, Rhynie, Aberdeen
1859 Reid, John, Hilton of Aldie, Kinross
1858 Reid, Peter, Nether Kildrummy, Mossat

Admitted
1850 Reid, Walter, Drem
1864 Reid, Walter, Park of Keir, Dunblane
1857 Reid, Wm., of Hayston, Kirkintilloch
1869 Reid, William, Granton, Edinburgh
1859 Reoch, J. F., of Gilmerton, Edinburgh
1852 Rhind, David, Architect, Edinburgh
1863 Richardson, D., of Hartfield, Glasgow
1849 Richardson, Francis, 16 Abbotsford Park, Edinburgh
1861 Richardson, James T. Stewart, yr. of Pitfour, Perth
1851 Richardson, John, Writer, Haddington
1863 Richardson, J., Drylawhill, Prestonkirk
1837 Richardson, Robert, 16 Bruntsfield Place, Edinburgh
1859 Richardson, Robert, Haddington
1863 Richardson, R., Crailingnook, Jedburgh
1854 Richardson, Thos., of Ralston, Glasgow
1861 Richmond, G., Lawhill, Auchterarder
1861 Richmond, John, Dron, Perth
1831 Rickman, Thomas, late Architect, Birmingham
1863 Ridddell, David, Kilbowie, Duntocher
1854 Riddell, Thomas, Oxnam Nook, Jedburgh
1852 Riddell, William, Hundalee, Jedburgh
1863 Riddell, William, Rink, Selkirk
1859 Riddick, G., Greenhill-head, Lockerbie
1861 Rigg, William, Banks, Kirkcudbright
1852 Rintoul, Charles, East Craigie, Cramond
1861 Rintoul, D. Upper Cairnie, Forteviot
1865 Rintoul, Robert, Lahill, Largo
1869 Ritchie, Charles, S.S.C., Edinburgh
1865 Ritchie, Charles, Piershill, Edinburgh
1863 Ritchie, James, 140 High Street, Edinburgh
1857 Ritchie, John, Newbigging Mains, Carnwath
1867 Ritchie, John, Whitecastle, Biggar
1833 Ritchie, R., Civil Engineer, Edinburgh
1838 Ritchie, T., Forest Mill, Clackmannan
1853 Ritchie, W., Nether Liberton, Liberton
1852 Ritchie, William, Plean Mill, Stirling
1865 Ritchie, W., of Middleton, Gorebridge
1849 Robb, James, Gorgie, Slateford
1863 Roberton, And., Hoselawbank, Kelso
1841 Roberton, James, Ladyrig, Kelso
1854 Roberton, John, Hoselaw, Kelso
1863 Roberton, John, jun., Harperton, Kelso
1863 Roberton, Robert, Ladyrig, Kelso
1856 Robertson, A. F., Ardlaw, Fraserburgh
1839 Robertson, Alex. Inglis, Aultnaskiach
1832 Robertson, Andrew, M.D., of Hopewell, Indego, Tarland
1840 Robertson, Arthur John, Inverness
1860 Robertson, Dr, Charles, Auchtercairn, Gairloch
1869 Robertson, C., of Kindeace, Invergordon
1861 Robertson, Daniel, Friarton, Perth
1842 Robertson, David, of Ladykirk, M.P., Berwick
1847 Robertson, D., Royal Hotel, Aberdeen

Admitted
1861 Robertson, David, Cloag, Methven
1847 Robertson, David Souter, of Whitehill, Edinburgh
1854 Robertson, Donald, of Pencross, Edinburgh
1864 Robertson, D. G., of Torrie, Callander
1860 Robertson, George B., Whitkirk, Prestonkirk
1857 Robertson, James, Woodend, Cathcart
1836 Robertson, James, Inverary
1859 Robertson, J., Denbrae, Cupar-Fife
1851 Robertson, James Stewart, of Edradynate, W.S., Edinburgh
1847 Robertson, John, Banker, Huntly
1855 Robertson, John, Australia
1854 Robertson, J., Glencripisdale, Strontian
1859 Robertson, John, S.S.C., Edinburgh
1864 Robertson, J., Old Blair, Blair-Athole
1865 Robertson, John, Drynie Mains, North Kessock
1865 Robertson, John, of Blairbeth, New Hall Factory, Glasgow.
1867 Robertson, J., Bellaty, Glenisla, Alyth
1828 Robertson, L., Royal Bank, Edinburgh
1857 Robertson, Neil, Frenich, Aberfoyle
1862 Robertson, Peter S., Trinity Nurseries, Edinburgh
1847 Robertson, Major-General Richardson, of Tullybelton, C.B., Bankfoot
1861 Robertson, Stewart Souter, yr. of Lawhead, Hamilton
1865 Robertson, Thomas W., Perth
1859 Robertson, W. M., of Gartloch, Glasgow
1826 Robertson, William, of Kinlochmoidart, Strontian
1857 Robertson, Wm., Cuttlebrae, Fochabers
1863 Robertson, William, V.S., Kelso
1868 Robertson, Wm., Banchory, Kinghorn
1863 Robeson, R., Springwells, Coldstream
1859 Robey, Robert, Engineer, Lincoln
1851 Robinow, Adolph, Merchant, Leith
1841 Robson, Charles, Lurdenlaw, Kelso
1863 Robson, Chas., jun., Lurdenlaw, Kelso
1853 Robson, John, Byreness, Otterburn
1851 Rodger, David, Penkiln, Garlieston
1861 Rodger, George, Bridgelands, Selkirk
1854 Rodger, Matthew, of Rossland, Glasgow
1859 Rodger, Peter, Selkirk
1838 Rodger, R., Hadlow Castle, Tunbridge
1865 Rodger, Robert M., Factor, Airdrie House, Airdrie
1857 Roger, Hugh, Attiquin, Maybole
1865 Roger, William, Wester Pitlour, Strathmiglo
1862 Rogers, James S., Rose Mill, Dundee
1851 Rogerson, G., Pearceby Hall, Lockerbie
1864 Rogerson, James, yr. of Whamphray, Lockerbie
1829 Rogerson, Wm., of Gillesbie, Lockerbie
1837 Rolland, Adam, of Gask
1869 Ronald, John, S.S.C., Prestonholme House, Lasswade

Admitted
1857 Ronaldson, Alexander, Glasgow
1863 Ronaldson, Alex., Little Gight, Methlic
1863 Romanes, Robt., of Harryburn, Lauder
1860 Rome, R. M., Ruggetshaws, Langholm
1869 Rose, Hugh, Solicitor, Inverness
1865 Rose, Jas., Mains of Connage, Inverness
1865 Rose, John, Kirktown, Inverness
1865 Rose, Major James, of Kilravoch, Nairn
1854 Rose, William, Sheriffston, Elgin
1857 Ross, Alexander, Inchley, Banchory
1868 Ross, Andrew, Parkdargue, Huntly
1864 Ross, David, Banker, Dingwall
1864 Ross, D. G., Seed Merchant, Dingwall
1839 Ross, George, of Pitcalnie, Parkhill
1865 Ross, George, Tore Farm, Munlochy
1849 Ross, Lieut.-Col. George W. H., of Cromarty
1863 Ross, James, Newton-lees, Kelso
1839 Ross, Major-Gen. J. K., K.H., Edin.
1858 Ross, H., jun., Wester Coull, Tarland
1843 Ross, John Leith, of Arnage, Ellon
1856 Ross, Thomas, Bachilton, Perth
1859 Ross, William, of Greenside, Largo
1850 Roughead, D., Seedsman, Haddington
1857 Rowan, J. M., Atlas Works, Glasgow
1856 Roy, Alex., Waterton, Insch, Aberdeen
1840 Roy, James, jun., Seedsman, Aberdeen
1822 Roy, Robert, W.S., Chester
1856 Royds, Robert Whyt, late Balgreddie, Kirkcaldy
1863 Ruddock, J. Willis, Hide Hill, Berwick
1846 Russell, Alex. James, W.S., Edinburgh
1854 Russell, Andrew Walker, of Kenlygreen, Newburgh
1867 Russell, A., Flemington, Cambuslang
1859 Russell, David, Silverburn, Leven
1835 Russell, Francis Whitworth
1858 Russell, G. E., 14 Regent Terrace, Edin.
1834 Russell, James, of Aden, Mintlaw
1848 Russell, James, 16 St Cuthbert Street, Edinburgh
1851 Russell, James, Coalstoun Mains, Haddington
1847 Russell, Dr James, of Breckonside, Thornhill
1862 Russell, John, Saughton Hall Mains, Slateford
1864 Russell, Lewis, Conon, Dingwall
1834 Russell, Robert, Edinburgh
1851 Russell, Robert, Pilmuir, Leven
1858 Rust, James, Paddocklaw, Banff
1860 Rutherford, George, Monteath's Houses, Gorebridge
1863 Rutherford, George, of Scaurs, Jedburgh
1863 Rutherford, G., Printonan, Coldstream
1863 Rutherford, John, Eldinhope, Selkirk
1861 Rutherford, John, Muirhall, Perth
1825 Rutherfurd, William Oliver, of Edgerston, Jedburgh
1863 Rutherfurd, William A. Oliver, yr. of Edgerston
1854 Ruxton, And., South Artrochie, Ellon

Admitted
1851 Ruxton, John, M.D., Hill of Fiddes, Foveran
1850 Ruxton, William, Farnell, Brechin

1849 †Sutherland, His Grace the Duke of, K.G.
1867 Strathmore, Right Hon. the Earl of
1830†Selkirk, Right Hon. the Earl of
1850†Southesk, Right Hon. the Earl of
1842†Seafield, Right Hon. the Earl of
1845 Stair, Right Hon. the Earl of
1861 Scott, Right Hon. Lord Henry, M.P.
1861 Scott, Right Hon. Lord Walter
1864 Scott, Right Hon. Lord Charles
1847†Strathallan, Right Hon. Viscount
1861 Stormont, Right Hon. Viscount
1854 Saltoun, Right Hon. Lord
1855 Sandilands, Hon. James, London
1864 Sinclair, Sir Robert Charles, of Stevenson, Bart.
1868 Stirling, Sir Charles E. F., of Glorat, Bart.
1848 Stewart, Sir M. R. Shaw, of Blackhall, Bart.
1829 Scott, Sir W., of Ancrum, Bart., M.P.
1839 Stewart, Sir Wm. Drummond, of Grandtully, Bart.
1834 Seton, Sir W. Coote, of Pitmedden, Bart.
1857 Sinclair, Sir J. G. T., of Ulbster, Bart.
1839 Suttie, Sir G. Grant, of Balgone, Bart.
1824 Sinclair, Sir John, of Dunbeath, Bart.
1835 Steuart, Sir Henry M. Seton, of Allanton, Bart.
1848 Simpson, Sir James Y., Bart., Professor of Midwifery, University of Edinburgh
1822 Stewart, Admiral Sir H., K.C.B.
1864 Sadler, Daniel B., late Balmuick, Crieff
1853 Sadler, William, Ferrygate, Drem
1869 Satlley, John, of Morinton, Dumfries
1858 Salmon, James, St Enoch Square, Glasgow
1856 Salmon, J., Johnstone Castle, Johnstone
1846 Salmond, Duncan, Rothesay
1858 Salmond, James, Cairnie, Arbroath
1845 Salmond, Robert, Banker, Glasgow
1868 Salmond, R., Nether Balfour, Durris
1844 Sanderson, Capt. A. C., of Glenlaggan, Castle-Douglas
1854 Sanderson, James, 10 Pall Mall East, London
1864 Sanderson, Wm., Corstorphine Bank, Corstorphine
1849 Sands, W. John, W.S., Edinburgh
1845 Sangster, Robert B., Banker, Golspie
1828 Scarth, James, Banker, Leeds
1862 Scarth, Pillans, W.S., Leith
1843 Scarth, Robert, of Binscarth, Kirkwall
1851 Scobie, John, Lochinver, Golspie
1854 Scoon, Ken., Braidwood, Gorebridge
1867 Scot, T. Goldie., of Craigmuie, Moniaive
1850 Scott, Alex,, Beanston, Prestonkirk
1860 Scott, A., Hopetoun, South Queensferry

Admitted
1848 Scott, And., Glendouglas, Jedburgh
1842 Scott, C. G., of Malleny, Balerno
1857 Scott, C., Palmerston, Cockburnspath
1859 Scott, C., Corn Merchant, Arbroath
1831 Scott, C. C., of Hawkhill, Greenock
1859 Scott, D., 3 Craigo Street, Montrose
1849 Scott, D., Meadowfield, Duddingston, Edinburgh
1866 Scott, D. G. C., Parks of Inches, Inverness
1821 Scott, Lieutenant-Colonel George
1863 Scott, George, Mosstower, Kelso
1861 Scott, Gideon James, Singlee, Selkirk
1853 Scott, Henry, Crosslee, Selkirk
1859 Scott, Hercules, of Brotherton, Bervie
1846 Scott, Hugh, of Gala, Galashiels
1868 Scott, James, Bogton, Bishopbriggs
1850 Scott, James, Merchant, Glasgow
1862 Scott, James, Easter Tullo, Stonehaven
1859 Scott, J., Enzieholm, Langholm
1843 Scott, J. Fitzmaurice, of Commieston
1863 Scott, Dr James Robson, of Ashtrees, Yetholm
1854 Scott, James R. Hope, of Abbotsford, Melrose
1862 Scott, John, Agricultural Commission Agent, Belford
1826 Scott, J., Finnart House, Greenock
1863 Scott, John Scott Elliot, Buckholm, Galashiels
1868 Scott, John, Drumpellier, Coatbridge
1868 Scott, Malcolm, Nether Inch, Milton of Campsie
1841 Scott, Captain Robert
1863 Scott, Robert, Kinninghall, Hawick
1857 Scott, Thomas, of Uddingston, Glasgow
1863 Scott, T., Whitton, Morebattle, Kelso
1860 Scott, T. Robson, of Newton, Jedburgh
1850 Scott, Walter, Glendronach, Huntly
1863 Scott, W., Edgerston Tofts, Jedburgh
1857 Scott, Wm., Timpendean, Jedburgh
1855 Scott, Wm., Wester Rora, Mintlaw
1855 Scott, William, Mossilee, Galashiels
1862 Scott, William, of Burnside, Alyth
1863 Scott, William, Howford, Selkirk
1857 Scott, William, North Leys, Banchory-Ternan
1868 Scott, William, Cononsyth, Arbroath
1863 Scott, W. Elliot, of Peel, Newcastleton
1863 Scott, William Monteath, yr. of Ancrum, Jedburgh
1863 Selby, Ephraim, Hassendean, Hawick
1849 Sellar, P. Plenderleith, Hartfield, Tain
1868 Sellar, R., Implement Maker, Huntly
1857 Sempill, John, late Ballemenach, Campbeltown
1868 Semple, J., Mains of Dunbarrow, Forfar
1857 Semple, Thomas, Mull
1854 Seton, Alex., of Preston, Linlithgow
1848 Seton, George, Advocate, Edinburgh
1859 Seton, Henry, V.S., Edinburgh

Admitted
1863 Shand, Alexander Burns, Sheriff of Kincardineshire
1844 Shand, John, W.S., Edinburgh
1868 Shand, George, Ordens, Banff
1864 Shand, William, late Crichton, Ford
1861 Sharp, Andrew, North Forr, Crieff
1846 Sharp, James, late Drums House, Renfrewshire
1835 Shaw, Charles, W.S., Sheriff-Substitute, Lochmaddy
1836 Shaw, David, W.S., Ayr
1850 Shaw, Hary, Bogfairn, Tarland
1863 Shaw, James, Skaithmuir, Coldstream
1868 Shaw, James, Tillyching, Lumphanan
1835 Shaw, Patrick, Advocate, Edinburgh
1861 Shaw, Thomas, Forter, Glenisla, Alyth
1861 Shaw, William, Finegand, Glenshee, Blairgowrie
1838 Shawe, R. F., of Bartingham, Thorpe, Hull
1857 Shennan, James, Balig, Kirkcudbright
1844 Shepherd, George, Shethin, Tarves
1865 Shepherd, George, jun., Craigie, Tarves
1858 Shepherd, Cap. T., of Kirkville, Skene
1866 Shiels, George, Horsupcleuch, Dunse
1829 Shireff, Charles, 1 Doune Terrace, Edin.
1864 Shireff, John Bell, Carronvale, Larbert
1859 Shirreff, Charles H., Corn Factor, Edinburgh
1861 Shirreff, Thomas, West Barns, Dunbar
1847 Shireff, David, Muirton, Drem
1850 Shireff, Samuel D., Saltcoats, Drem
1854 Shortreed, R., Attonburn, Yetholm
1866 Sim, Alexander, Fawells, Keith-Hall
1858 Sim, William, 4 St Bernard's Crescent, Edinburgh
1830 Simpson, Alex. Horatio, late Hayes, Uxbridge
1860 Simpson, A., Clerk of Supply, Dumfries
1860 Simpson, Alex., Smeaton, Dalkeith
1853 Simpson, George, Bedrule, Jedburgh
1868 Simpson, George, Burreldales, Alvah, Banff
1851 Simpson, James, Mawcarse, Kinross
1863 Simpson, Richard, Haggerston, Beal, Northumberland
1839 Simpson, Robert, of Cobairdy, Huntly
1850 Simson, Charles, of Threepwood, Lauder
1841 Simson, George, of Pitcorthie, Leven
1861 Simson, George, Courthill, Kelso
1850 Simson, Thomas, Blainslie, Lauder
1839 Sinclair, A., 133 George St., Edinburgh
1859 Sinclair, Arch., Minard, Inveraray
1863 Sinclair, David, Loirston, Aberdeen
1826 Sinclair, Dugald, Kilchamaig, Tarbert
1830 Sinclair, James, of Forss, Thurso
1858 Sinclair, James, Westmill, Inchture
1856 Sinclair, John, Borlum, Glen Urquhart
1869 Sinclair, Peter, Merchant, Kilmartin
1863 Sinton, Thomas, Aberarder, Laggan
1850 Sivewright, James, late Finlayston House, Port-Glasgow

Admitted
1831 Skene, William F., W.S., Edinburgh
1823 Skinner, Capt. C. G. Macgregor, Carisbrooke House, Isle of Wight
1827 Skinner, Jas., Drumin, Ballindalloch
1859 Skinner, James, Woodside, Aberdeen
1858 Skinner, John, Balwhimry, Markinch
1868 Skinner, J. H., 45 Moray Pl., Edinburgh
1869 Skinner, W., of Corra, W.S., Edinburgh
1857 Skirving, Adam, of Croys, Dalbeattie
1850 Skirving, James, Luffness Mains, Drem
1846 Skirving, R. Scot, Camptoun, Drem
1858 Sleigh, John, Land-Surveyer, Strichen
1863 Slipper, R. B., Stamford Hill, London
1861 Sloan, D., Coach Builder, Dumfries
1843 Small, David, Writer, Dundee
1859 Small, Jas., of Dirnanean, Blairgowrie
1857 Small, Lindsay, 19 Dodington, Whitechurch, Salop
1867 Small, P., of Brewlands, Glenisla
1843 Small, William, Merchant, Dundee
1864 Smart, Jas., Liberton Park, Liberton
1858 Smart, John, Glasgowego, Blackburn, Aberdeen
1857 Smith, Adam, Stevenson Mains, Haddington
1847 Smith, Alex., Civil Engineer, Aberdeen
1852 Smith, Alexander (A. & W. Smith & Co.), Glasgow
1863 Smith, Alexander, Letham, Berwick
1864 Smith, Alexander P., Munlochy Farm, Munlochy
1862 Smith, A., Willowbrae House, Edin.
1856 Smith, Andrew, Castle Mains, Douglas
1864 Smith, Andrew, Solicitor, Dingwall
1868 Smith, Andrew, Castle Mains, Gifford
1838 Smith, A., Sheriff-Substitute, Glasgow
1853 Smith, C., Whittingham, Prestonkirk
1836 Smith, C. H. Johnstone, late Edinburgh
1833 Smith, David, W.S., Edinburgh
1839 Smith, E. B., of Blackwood House, Ecclefechan
1864 Smith, F. C., Hoprig, Cockburnspath
1839 Smith, G., Minmore, Ballindalloch
1862 Smith, George, 46 Port-Dundas Road, Glasgow
1853 Smith, Major H., of Cruicksfield, Dunse
1857 Smith, Hugh (Smith Brothers & Co.), Glasgow
1855 Smith, James, Dundee
1855 Smith, James, of Olrig, Thurso
1857 Smith, James, Broomhill, Partick
1857 Smith, Jas., 11 Roxburgh St., Edin.
1859 Smith, James, 11 Dixon St., Glasgow
1869 Smith, J., Mullochard, Ballindalloch
1851 Smith, John, Advocate, Aberdeen
1857 Smith, J., Ballochantay, Campbeltown
1858 Smith, John, Coynachie, Gantly
1865 Smith, John, Inverallan, Grantown
1852 Smith, J. Gordon, Nevie, Ballindalloch
1867 Smith, J. Turnbull, C.A., Edinburgh
1854 Smith, John T., Goswick, Berwick-on-Tweed

Admitted
1839 Smith, Robert, S.S.C., Edinburgh
1850 Smith, Robert, Ladyland, Dumfries
1864 Smith, Robert, Hayford Mills, Stirling
1854 Smith, R. M., Merchant, Leith
1850 Smith, Thomas, Dalfibble, Dumfries
1823 Smith, William, Kirknewton
1854 Smith, W., East Learmonth, Coldstream
1856 Smith, Wm., West Drums, Brechin
1857 Smith, William, Buckie
1858 Smith, William, Hillford, Monymusk
1860 Smith, William, Banker, Moniaive
1863 Smith, W., Stone of Morphie, Montrose
1868 Smith, William, New Mains of Ury, Stonehaven
1869 Smith, Wm., Shanlockfoot, Penpont
1826 Smollet, A., of Bonhill, Dumbarton
1846 Smythe, William, of Methven, Perth
1857 Snodgrass, Allan, Mollandu, Cardross
1857 Somervail, P., Glendevon, Linlithgow
1857 Somervell, G., of Sorn, Mauchline
1848 Somerville, J., Ladyurd, Noblehouse
1858 Somerville, James, S.S.C,, Edinburgh
1859 Somerville, John, Lanark
1841 Somerville, Samuel, of Ampherlaw, M.D., Edinburgh
1845 Somerville, S. H. M., of Broadfield, Port-Glasgow
1850 Somerville, Wm., Merchant, Glasgow
1854 Souter, Alexander, Banff
1865 Spears, Wm. R., Writer, Kirkcaldy
1843 Speid, James, of Forneth, Blairgowrie
1858 Speir, Robert, Blair Park, Largs
1838 Speir, Thomas, of Blackston, Paisley
1838 Speirs, T. Dundas, Burnfoot, Houston
1860 Spence, Adam White, Merchant, Leith
1861 Spens, Archd., of Lethallan, Falkirk
1848 Spens, N., of Craigsanquhar, Cupar-Fife
1863 Spowart, T., of Broomhead, Dunfermline
1830 Sprot, James, of Spot, Dunbar
1830 Sprot, John, Ayr
1820 Sprot, Mark, of Garnkirk, Glasgow
1830 Sprot, Mark, of Riddell, Lilliesleaf
1826 Sprot, Thomas, W.S., Edinburgh
1836 Stables, W. A., Cawdor Castle, Nairn
1854 Starforth, John, Architect, Edinburgh
1858 Stark, Andw., Hill of Beath, Crossgates
1862 Stark, Ralph, Camelon, Falkirk
1861 Stark, W., late Contentibus, Mid-Calder
1851 Stedman, J., Wester Ulston, Jedburgh
1847 Steedman, James, Boghall, Roslin
1862 Steedman, J., Charleston, Dunfermline
1860 Steel, Christ., Auchenfranco, Dumfries
1853 Steele, Robert, Greenock
1828 Steele, William, Sheriff-Substitute of Dumbarton
1854 Stegmann, Conrad, Merchant, Leith
1850 Stenhouse, G., West Pilton, Blackhall
1850 Stenhouse, J., Southfield, Corstorphine
1861 Stenhouse, James, Myles, Tranent
1858 Stephen, James, Conglass, Keith-hall
1826 Stephens, Henry, Redbrae Cottage, Edinburgh

Admitted
1845 Steuart, Andw., of Auchlunecart, Keith
1835 Steuart, Archibald Seton, Alloa
1857 Steuart, D., of Steuart Hall, Stirling
1842 Steuart, James, W.S., Edinburgh
1864 Steuart, James, junior, Edinburgh
1857 Steuart, John, Writer, Pollockshaws
1859 Steuart, Patrick, Middlegill, Moffat
1864 Steuart, Captain Robert, of Carfin, Westwood, West Calder
1855 Steuart, Robert, Brownlee, Carluke
1833 Steuart, William, London
1832 Stevens, M., of Bellahouston, Glasgow
1839 Stevenson, Alex., Banker, Langholm
1855 Stevenson, Andrew, Halls, Dunbar
1850 Stevenson, C., 377 High Street, Edin.
1853 Stevenson, David, C.E., Edinburgh
1842 Stevenson, John, Balimore, Oban
1853 Stevenson, John B., New Zealand
1864 Stevenson, John, Hillhead, Sorn, Mauchline
1860 Stevenson, Robert, China
1852 Stevenson, T., Mount-Lothian, Penicuik
1860 Stewart, Alexander, Tempar, Rannoch, Pitlochire
1858 Stewart, Alex. J., W.S., Edinburgh
1862 Stewart, Alex., Craigenseat, Huntly
1865 Stewart, Alex., Bog of Cawdor, Nairn
1860 Stewart, Andrew, Auctioneer, Dumfries
1834 Stewart, Chas., Kerrowmore, Aberfeldy
1823 Stewart, Charles, of Hillside, Lockerbie
1840 Stewart, Charles, Solicitor, Inverness
1858 Stewart, Charles, Tighnduin, Killin
1842 Stewart, David, London
1862 Stewart, David, Kippenross, Dumblane
1859 Stewart, Donald, Clachan, Blair-Athole
1863 Stewart, Lieutenant Duncan, R.N.
1869 Stewart, F. B., Newkirk, Tarland
1844 Stewart, G., Kirkchrist, Kirkcudbright
1837 Stewart, Henry, of St Fort, Newport
1838 Stewart, H. B., of Balnakeilly, Pitlochrie
1857 Stewart, H. G. Murray, of Broughton, Gatehouse
1851 Stewart, J., Pitskelly, St Martins, Perth
1854 Stewart, James, New Market, Aberdeen
1858 Stewart, James, Heathfield, Irvine
1857 Stewart, James, Ballyorgan, Ardrishaig
1869 Stewart, James W., C.E., Edinburgh
1819 Stewart, John, London
1823 Stewart, John, of Dalguise, Dunkeld
1854 Stewart, John, Strathaven
1855 Stewart, John, Upper Ardroscadale, Rothesay
1852 Stewart, John, Duntulm, Portree
1824 Stewart, J. Lorn, of Coll, Campbeltown
1853 Stewart, John Archd. Shaw, London
1862 Stewart, Malcolm, Fife Keith, Keith
1837 Stewart, M. S., of Southwick, Dumfries
1869 Stewart, Mark John, yr. of Southwick Ardwell, Stranraer
1863 Stewart, Neil P., Cemaes, Llanrwst, North Wales

Admitted
1859 Stewart, Osmond de Haviland, Waterhead, Lockerbie
1860 Stewart, Peter, Cowburn, Lockerbie
1854 Stewart, Major Robert, of Ballechin, Ballinluig
1858 Stewart, Robt., of Ingliston, Kirkliston
1859 Stewart, Robert Balfour, yr. of St Fort, Newport
1846 Stewart, Robert H. Johnston, of Physgill, Whithorn
1857 Stewart, Samuel, Sandhole, Strichen
1859 Stewart, Thomas, Gillenbie, Lockerbie
1859 Stewart, Walter, Mains of Kynachan, Pitlochrie
1829 Stewart, Wm., late Ballaterach, Ballater
1844 Stewart, William, of Blackhouse, Largs
1850 Stewart, Wm., Tonroich, Campbeltown
1857 Stewart, William, Pininver, Campbeltown
1860 Stewart, William, Saddler, Aberfeldy
1868 Stewart, W. Bruce, of Burgh, Kirkwall
1864 Stirling, Gilbert, 9th Lancers, Larbert, Falkirk
1857 Stirling, Major Graham, of Craigbarnet, Strathblane
1852 Stirling, James, C.E., Edinburgh
1867 Stirling, James, of Garden, Kippen
1833 Stirling, Jn., of Kippendavie, Dunblane
1865 Stirling, Captain John, of Gargunnock, Stirling
1839 Stirling, T. Graham, of Strowan, Crieff
1855 Stirling, Wm., of Tarduff, Linlithgow
1867 Stobo, Andrew, Poterstown, Thornhill
1860 Stobo, Robert, of Hallidayhill, Auldgirth Bridge
1855 Stodart, Archibald, Covington, Biggar
1855 Stodart, David, Banker, Lanark
1839 Stodart, George Tweedie, of Oliver, W.S., Edinburgh
1855 Stodart, James, Walston, Carnwath
1851 Stodart, John, Bangour, Uphall
1864 Stodart, Thomas, Boreland, Lockerbie
1855 Stodart, William, Wintonhill, Tranent
1850 Storrie, Francis, V.S., East Linton
1832 Stott, Gibson, London
1859 Stott, Joseph Hood, Niddry Street, Edinburgh
1858 Strachan, James, Wester Fowlis, Alford
1858 Strachan, Lewis, Cluny of Raemoir, Banchory
1857 Strang, J., High Crewburn, Strathaven
1842 Straton, Geo. T., of Kirkside, Montrose
1859 Strong, Thomas, W.S., Edinburgh
1859 Struthers, Dr John, Professor of Anatomy, Aberdeen
1863 Stuart, Alexander C., of Eaglescairnie, Haddington
1865 Stuart, Alexander, of Laithers, Turriff
1863 Stuart, Gilbert, Runningburn, Stitchel, Kelso
1868 Stuart, Henry, Factor for the Bute Estate, Rothesay

Admitted
1865 Stuart, James, Aldich, Ballindalloch
1853 Sutherland, Eric, Tannachie House, Fochabers
1849 Sutherland, George, of Forse, Lybster
1856 Sutherland, Joseph, Shineas, Lairg
1864 Sutherland, Neil, Kennetpans Chemical Works, Clackmannan
1856 Sutherland, Robert, Shiness, Lairg
1852 Sutherland, S., Balliefeary, Inverness
1858 Swan, Jas., Live Stock Agent, Edin.
1851 Swan, John, Cattle Salesman, Edin.
1865 Swan, P. D., Provost of Kirkcaldy
1852 Swan, Robert, Writer, Kelso
1863 Swan, Sam., Overton, Bush, Jedburgh
1858 Swan, Thos., Live Stock Agent, Edin.
1861 Swann, James, Collierhall, Douglas
1859 Swann, J. R., Leith Walk, Edinburgh
1865 Swanwick, R., Whittington, Chesterfield
1857 Swinburne, Capt. R. N., of Elian Shona, Greenock
1841 Swinton, Archibald Campbell, of Kimmerghame, Dunse.
1862 Swinton, P. Burn, Holyn Bank, Gifford
1853 Sydserff, Thomas Buchan, of Ruchlaw, Prestonkirk
1859 Syme, George, Couston, Aberdour
1838 Syme, James, Professor of Clinical Surgery, University of Edinburgh
1857 Syme, William, Craigie, Leuchars
1868 Syminton, Gilbert, City of Glasgow Bank, Glenluce
1868 Symington, Geo., Kirkcarswell, Rerrick, Kirkcudbright
1848 Symington, T., late Eastside, Penicuik

1809*Tweeddale, Most Noble the Marquis of, K.T., President of the Society
1831 Torphichen, Right Hon. Lord
1824 Thriepland, Sir Patrick Murray, of Fingask, Bart.
1845 Tait, Alexander D., of Milrig, Galston
1846 Tait, James, Banker, Kelso
1866 Tait, James, Campbell, W.S., Edin.
1834 Tait, J., Advocate, Sheriff of Perthshire
1861 Tait, John, Langrig, Whitsome
1863 Tait, Joseph, Lindean, Selkirk
1852 Tait, Joseph, Brankanentham, Portsoy
1863 Tait, Robert, Leesmill, Coldstream
1863 Tait, William, Vencheon, Kelso
1862 Tait, William Reid, Pennyland, Thurso
1862 Tawse, John, W.S., Edinburgh
1859 Tawse, John Wardrope, W.S., Edin.
1858 Tayler, W. J., of Glenbarry, Rothiemay
1863 Taylor, Alexander, Hillhouse, Lauder
1869 Taylor, Andrew, Banker, Cupar-Fife
1858 Taylor, George, of Kirtonhill, Montrose
1868 Taylor, James B., V.S., Aberdeen
1858 Taylor, John B., Seton West Mains, Prestonpans
1853 Taylor, M., Letter Farm, Cove, Greenock
1861 Taylor, John, Redcastle, Chance Inn
1857 Taylor, Robert, Campbeltown

Admitted
1857 Taylor, Robert, Dumfremny, Banchory
1857 Templeton, Robert, Rannachan, Campbeltown
1853 Tennant, Charles, of the Glen, Peebles
1838 Tennant, Chas. J., St Rollox, Glasgow
1833 Tennant, John, St Rollox, Glasgow
1863 Tennant, Robert, of Tranent
1859 Thallon, Robert, Devon, Kennoway
1855 Thew, E., Shortridge House, Alnwick
1864 Thom, David, Merchant, Leith
1858 Thom, James C., Quethillhead, Durris, Aberdeen
1855 Thomas, James, Forthar, Kettle
1861 Thomas, Robert, Manure Manufacturer, Newtyle
1845 Thompson, Andrew, Berwick-on-Tweed
1868 Thompson, Geo., of Pitmedden, Dyce, Aberdeen
1867 Thompson, Henry, of High Green, Ramshope, Otterburn
1867 Thompson, R. G., Rutherford, Kelso
1861 Thoms, Patrick Hunter, of Aberlemno, Dundee
1825 Thomson, Alexander, Banker, Greenock
1858 Thomson, Alex., Bar, Haugh of Urr
1867 Thomson, A., of Mainhill, St Boswells
1867 Thomson, Charles W., C.A., Edinburgh
1836 Thomson, George, of Burnhouse, Stow
1854 Thomson, George, 4 Oxford Street, Edinburgh
1863 Thomson, George, Hopton, Jedburgh
1828 Thomson, J., late Papple, Haddington
1855 Thomson, James, Mungoswells, Dunse
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1861 Thomson, J., late of Acrehead, Dumfries
1868 Thomson, Jas., Newseat of Dumbreck, Udny
1848 Thomson, John Anstruther, of Charleton, Colinsburgh
1868 Thomson, J., Newton of Skene, Aberdeen
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1857 Thomson, Robert, Seggie, Guard Bridge
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1859 Thomson, Samuel, Blaiket, Crocketford, Dumfries
1850 Thomson, Thomas, Merchant, Glasgow
1841 Thomson, William Thomas, Edinburgh
1844 Thomson, William, of Balgowan, Perth
1854 Thomson, W., Grain-Merchant, Edin.
1860 Thomson, W., (Hill & Thomson), Edin.
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1866 Thomson, W. H., Sheriff-Substitute, Inverness
1859 Thorburn, David, Calgary, Tobermory

Admitted
1824 Threshie, David Scott, W.S., Jersey
1859 Thynne, Wm., Hoprig Mains, Tranent
1844 Timins, William, of Hillfield, Stanmore, Middlesex
1849 Tindal, James, Stonehaven
1859 Tod, Alexander, Aitkendean, Lasswade
1851 Tod, George, Lochran, Blair-Adam
1853 Tod, Robert, Cardrona Mains, Peebles
1864 Tod, Captain R. A. Boothby, of Howden, Mid-Calder
1851 Tod, William, Gospetrie, Kinross
1852 Tod, William, Graham St., Edinburgh
1864 Tod, William, Glenree, Lamlash, Arran
1858 Todd, James, Dunure Mains, Maybole
1865 Todd, James, Castle Mains, Dirleton
1838 Todd, John, of Finnich, Drymen
1865 Tolmie, Alex., Ballisparden, Ardersier
1827 Torrance, George M'Micken, of Threave, Edinburgh
1863 Torrance, George, Sisterpath, Dunse
1863 Torrance, T., Whitsome Laws, Chirnside
1831 Torrance, Wm., Hyvotsbank, Liberton
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1863 Wilson, J. P., of Polquhairn, Cumnock
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1868 Wishart, W., Cairntraddlyn, Blackburn
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1835 Wood, John, Banker, Colinsburgh
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Admitted
1853 Wright, Jas., Secy., Royal Bank, Edin.
1857 Wright, William, Woodlands, Girvan
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1852 Yule, Thomas B., Merchant, Leith.
1868 Yull, John S., Little Ardo, Methlic

1840 Zetland, Right Hon. The Earl of, K.T.

Total Number of Members, 3867.

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INDEX.

Aberdeen Show, 1868, Premiums offered at, Appendix C, 41 — Premiums awarded at, Appendix B, 107. Abstract of the Accounts of, Appendix B, 132.

Accounts. *See* Finance.

Agricultural Education, Council on, Appendix C, 10—Appendix D, 9—Bye-Laws, Appendix C, 61—Appendix D, 60.

Agriculture of Dumfriesshire, Report on, by Rev. John Gillespie, A.M., 270—by H. Newby Fraser, 326.

Agriculture of Perthshire, Report on, by John Dickson, W.S., 160.

Agriculture of the Isle of Man, Report on, by John Honeyman, 359.

Ammoniacal and Phosphatic Manures, Report on, by R. J. Thomson, 137.

Analyses. *See* Chemical Department.

Anderson, Thomas, M.D., F.R.S.E., Chemist to the Society:—Analyses of the Soils and Subsoils on which the Field Experiments of 1866 were made, 190—Experiments made during the season 1867, 211—on the Composition of the different kinds of Linseed and the cakes they yield, 489—Analyses of the Soils and Subsoils on which the Field Experiments of 1867 were made, 502—Note regarding the Field Experiments of 1868, 512.

Argyll Naval Fund, Abstract of Accounts for 1866–67, Appendix A, 76—for 1867–68, Appendix B, 134.

Bean-meal, Report on the Comparative Feeding Values of Oat and, by Robert J. Thomson, 66.

Bearded White Wheat, Report on, by Patrick Shirreff, 38.

Bell, Rev. Patriek, LLD., Carmyllie, Forfarshire:—Resolution in regard to Testimonial to, Appendix A, 17—Presentation of Testimonial, Appendix A, 30.

Borthwick, Hugh, Middlestead, Selkirk: Report on Foot Rot in Sheep, 30—Scab in Sheep, 346.

Cabbage, Report of Field Experiments on the action of an equal money value of different Top-Dressings on Wheat, Grass, and Cabbage in 1866, by Russell Swanwick, 90.

Chemical Department, Note in regard to, with Instructions for selecting samples for Analyses, and Scale of charges for Analyses, Appendix C, 63—Appendix D 62.

Chemical Department, Proceedings of the, by Dr Anderson:—Analyses of the Soils and Subsoils on which the Field Experiments of 1866 were made, 190—Experiments made during the season 1867, 211—on the Composition of the different kinds of Linseed and the cakes they yield, 489—Analyses of the Soils and Subsoils on which the Field Experiments of 1867 were made, 502—Note regarding the Field Experiments of 1868, 512.

Clerk, Right Hon. Sir George, of Penicuik, Bart., Honorary Secretary of Society, death of, Appendix A, 22.

Clover, Report of Experiments with different Top-Dressings on Ryegrass and Clover, by Russell Swanwiek, 72.

Committees for 1868, Appendix A, 78—for 1869, Appendix D, 10.

Coniferæ, Report on Pruning of the rarer, by Robert Hutchison, 335.

Dickson, John, W.S., Greenbank, Perth: Report on the Agriculture of Perthshire, 160.

Dietaries of Scotch Agricultural Labourers, Report on, by Robert Hutchison of Carlowrie, 1.

Dorrery, Report on the Improvement of Meadow Pasturage, by relieving it from injurious flooding, on part of the Crown Lands of, in the County of Caithness, with Plan, by James Purves, 439.

Dumfriesshire, Report on the Agriculture of, by Rev. John Gillespie, A.M., 270—by H. Newby Fraser, 326.

Dumfries Show, 1870, List of Classes of Stock, Appendix D, 56.

Edinburgh Show, 1869, Premiums offered at, Appendix D, 43.
Establishment for 1868, Appendix C, 8 —for 1869. Appendix D, 7.

Field Experiments, Report of, on the action of an equal money value of different Top-Dressings on Wheat, Grass, and Cabbage, 1866, by Russell Swanwick, 90.
Field Experiments, Analyses of the Soils and Subsoils on which they were made in 1866, 190—Account of Experiments made during the season 1867, 211—Analyses of the Soils and Subsoils on which they were made in 1867, 502—Note regarding the Experiments of 1868, 512.
Finance:—State of the Funds of the Society at 30th Nov. 1867, Appendix A, 73—Abstract of the Accounts for 1866–67, Appendix A, 74—Abstract of the Accounts of the Glasgow Show, 1867, Appendix A, 76—Accounts of the Argyll Naval Fund, 1866–67, Appendix A, 76—State of the Funds of the Society at 30th Nov. 1868, Appendix B, 129—Abstract of the Accounts for 1867–68, Appendix B, 130 — Abstract of the Accounts of the Aberdeen Show, 1868, Appendix B, 132—Abstract of the Accounts of the Argyll Naval Fund, 1867–68, Appendix B, 134.
Food for Stock, Report on different descriptions of, by Robert J. Thomson, 52.
Foot Rot in Sheep, Report on, by Hugh Borthwick, 30.
Forest Trees, Report on the Pruning of, by John Morrison, 42.
Fraser, H. Newby, Wyseby Hill, Ecclefechan: Report on the Agriculture of Dumfriesshire, 326.

Gillespie, Rev. John, A.M., Mouswald Manse, Dumfries: Report on the Agriculture of Dumfriesshire, 270.
Glasgow Show, 1867, Premiums awarded at, Appendix A, 47. Abstract of the Accounts of, Appendix A, 76.
Grass: Field Experiments on the action of an equal money value of different Top-Dressings in Wheat, Grass, and Cabbage in 1866, by Russell Swanwick, 90.
Grasses: Report of different Top-Dressings on Rye Grass and Clover, by Russell Swanwick, 72.
Grigor, John, Forres Nurseries, Forres: Report on Larch Forests, 415.

Hedgerow Trees, Report on, by John Morrison, 105.
Highland and Agricultural Society:—Proceedings at Board Meetings, 1867–68, Appendix A, 33—1868–69, Appendix B, 96—Proceedings at General Meetings, June 1866 to January 1868, Appendix A, 2—June 1868 and January 1869, Appendix B, 81.
Honeyman, John: Report on the Isle of Man ; its Agriculture, Climate, &c., 359.
Hutchison, Robert, of Carlowrie, Kirkliston : Report on the Dietaries of Scotch Agricultural Labourers, 1—on Pruning of the rarer Coniferæ, 335 —on Trees not liable to be destroyed by Rabbits, 456.

Isle of Man, Report on its Agriculture, Climate, &c., by John Honeyman, 359.

Labourers, Report on the Dietaries of Scotch Agricultural, by Robert Hutchison, 1.
Larch Forests, Report on, by C. Y. Michie, 368—by John Grigor, 415.
Linseed, on the Composition of the different kinds of, and the Cakes they yield, by Dr Anderson, 489.
Lochend, Report on the Reclamation of Waste Land on the Farms of Lochend and Syster, in the County of Caithness, by James Purves, 429.

Macduff, Alexander, of Bonhard, Secretary of the Society, death of, Appendix A, 2.
Man, Report on The Isle of, its Agriculture, Climate, &c., by John Honeyman, 359.
Mangold Wurzel, Report on the Comparative Feeding Values of Swedes and, by Robert J. Thomson, in 1864, 52 ; 1865, 60—Cultivation of, by Robert J. Thomson. 146.
Manures, Phosphatic and Ammoniacal, Report on, by R. J. Thomson, 137.
Manures : Report of Experiments on Oats with two different Manures, by William Walker, 116.
Maxwell, John Hall, of Dargavel, C.B., late Secretary of the Society, death of, Appendix A, 9.
Maxwell, Sir William Stirling, of Polloc, Bart., appointment of, as Honorary Secretary of the Society, Appendix A, 22.
Meadow Pasturage, Report of the Improvement of, by relieving it from injurious flooding on part of the

Crown Lands of Dorrery, in the County of Caithness, with Plan, by James Purves, 439.
Meal, Report on the Comparative Feeding Values of Bean and Oat, by Robert J. Thomson, 66.
Members, List of, 1869, Appendix E.
Menzies, Fletcher Norton, appointment of, as Secretary to the Society, Appendix A, 2.
Menzies, George, Trentham, Stoke-upon-Trent: Report on the Transit of Stock, 461.
Michie, C. Y., Cullen House, Cullen: —Report on the Management and Value of Poplar, 118—on the General Management of Plantations, 245—on Larch Forests, 368—on Trees not liable to be destroyed by Rabbits, 446.
Milne, John, Mains of Laithers, Turriff: Report on the Comparative Productiveness of Turnips, 340.
Morrison, John, Coney Park Nursery, Stirling:—Report on Pruning Forest Trees, 42—on Turnips for Seed, 101 —on Hedgerow Trees, 105.

Oatmeal, Report on the Comparative Feeding Values of Bean and, by Robert J. Thomson, 66.
Oats, Report of Experiments on, with two different Manures, by William Walker, 116.
Office-Bearers of the Society for 1868, Appendix C, 8—for 1869, Appendix D, 7.

Perthshire, Report on the Agriculture of, by John Dickson, W.S., 160.
Phosphatic and Ammoniacal Manures, Report on, by R. J. Thomson, 137.
Plantations, Report on the General Management of, by C. Y. Michie, 245.
Ploughing Competitions, List of, held in 1866–67, Appendix A, 68—held in 1867–68, Appendix B, 125.
Poplar, Report on the Management and Value of, by C. Y. Michie, 118.
Preliminary Note, Appendix A, 1.
Premiums awarded by the Society in 1867, Appendix A, 46—awarded in 1868–69, 107.
Premiums offered by the Society in 1868, Appendix C—offered in 1869, Appendix D.
Proceedings at Board Meetings of the Society, 1867–68, Appendix A, 33— in 1868–69, Appendix B, 96.
Proceedings at General Meetings of the Society, June 1866 to January 1868, Appendix A, 2—June 1868 and January 1869, Appendix B, 81.
Pruning of Forest Trees, Report on, by John Morrison, 42.
Pruning of the rarer Coniferæ, Report on, by Robert Hutchison, 335.
Purves, James, Lochend, Thurso:—Report on the Reclamation of Waste Land on the farms of Lochend and Syster, in the County of Caithness, 429—on the Improvement of Meadow Pasture, by relieving it from injurious flooding on part of the Crown Lands of Dorrery, in the County of Caithness, with Plan, 439.

Rabbits, Report on Trees not liable to be destroyed by, by C. Y. Michie, 446 —by Robert Hutchison, 456.
Rye-Grass, Report of Experiments with different Top-Dressings on Rye-Grass and Clover, 1856, by Russell Swanwick, 72.

Scab in Sheep, Report on, by Hugh Borthwick, 346.
Seed Competitions held in 1867, Returns of, Appendix A, 67—held in 1868, Appendix B, 124.
Shaw, Hary, Bogfern, Tarland: Report on the Comparative Productiveness of Turnips, 110.
Sheep, Report on Foot-Rot in, by Hugh Borthwick, 30.
Sheep, Report on Scab in, by Hugh Borthwick, 346.
Shirreff, Patrick, Haddington: Report on Shirreff's Bearded White Wheat, 38.
Stock, Report on Different Descriptions of Food for, by Robert J. Thomson, 52.
Stock, Report on the Transit of, by George Menzies, 461.
Swanwick, Russell, Whittington, Chesterfield: Reports of Experiments with different Top-Dressings: on Rye-Grass and Clover, Crop 1865, 72—on Turnips, Crop 1865, 83—on Wheat, Crop 1865, 86—Field Experiments on the action of an equal money value of different Top-Dressings on Wheat, Grass, and Cabbage, 1866, 90.
Swedes, Report of Experiments on the Comparative Feeding Value of Mangold Wurzel and, by Robert J. Thomson, in 1864, 52—in 1865, 60.
Syster, Report on the Reclamation of Waste Land on the farms of Lochend and Syster, in the County of Caithness, by James Purves, 429.

Thomson, Robert J., Grange, Kilmarnock:—Reports on different descrip-

tions of Food for Stock: Experiments on the Comparative Feeding Values of Swedes and Mangold Wurzel in 1864, 52; in 1865, 60—Comparative Feeding Values of Bean and Oatmeal, 66—Phosphatic Ammoniacal Manures, 137—Cultivation of Mangold Wurzel, 146.

Top-Dressings, Reports of Experiments with different, by Russell Swanwick: —on Rye-Grass and Clover, Crop 1865, 72—on Turnips, Crop 1865, 83—on Wheat, Crop 1865, 86—on Wheat, Grass, and Cabbage, 1866, 90.

Torran, Report of the Improvement of Meadow Pasturage, by relieving it from injurious flooding, on the Leens of, part of the Crown Lands of Dorrery, in the County of Caithness, with Plan, by James Purves, 439.

Transit of Stock, Report on, by George Menzies, 461.

Trees not liable to be destroyed by Rabbits, Report on, by C. Y. Michie, 446—by Robert Hutchison, 456.

Trees, Report on Pruning Forest, by John Morrison, 42.

Trees, Report on Hedgerow, by John Morrison, 105.

Turnips, Comparative feeding values of Swedes and Mangold Wurzel, by R. J. Thomson, 52.

Turnips for Seed, Report on, by John Morrison, 101.

Turnips, Comparative productiveness of, by Hary Shaw, 110—by John Milne, 340.

Turnips, Report of Experiments with different Top-Dressings on, by Russell Swanwick, 83.

Veterinary Department, Note regarding, Appendix C, 60—Appendix D, 59.

Walker, William, Ardhuncart, Mossart, Aberdeenshire: Report of Experiments on Oats with two different Manures, 116.

Waste Land, Report on the Reclamation of, on the farms of Lochend and Syster, in the County of Caithness, by James Purves, 429.

Wheat, Shirreff's Bearded White, Report on, by Patrick Shirreff, 38.

Wheat, Report of Experiments with different Top-Dressings on, by Russell Swanwick. Crop 1865, 86—Crop 1866, 90.

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